GENERAL, TECHNICAL DATA

TRANSMISSION IDENTIFICATION

The 02M manual transmission is installed as a 5- or 6-speed transmission in conjunction with a 4-cylinder engine in the New Beetle From 1998 and on.

Application. See **CODE LETTERS, APPLICATION, RATIOS, CAPACITIES** .

Location on transmission

Code letters and date of manufacture (arrow)

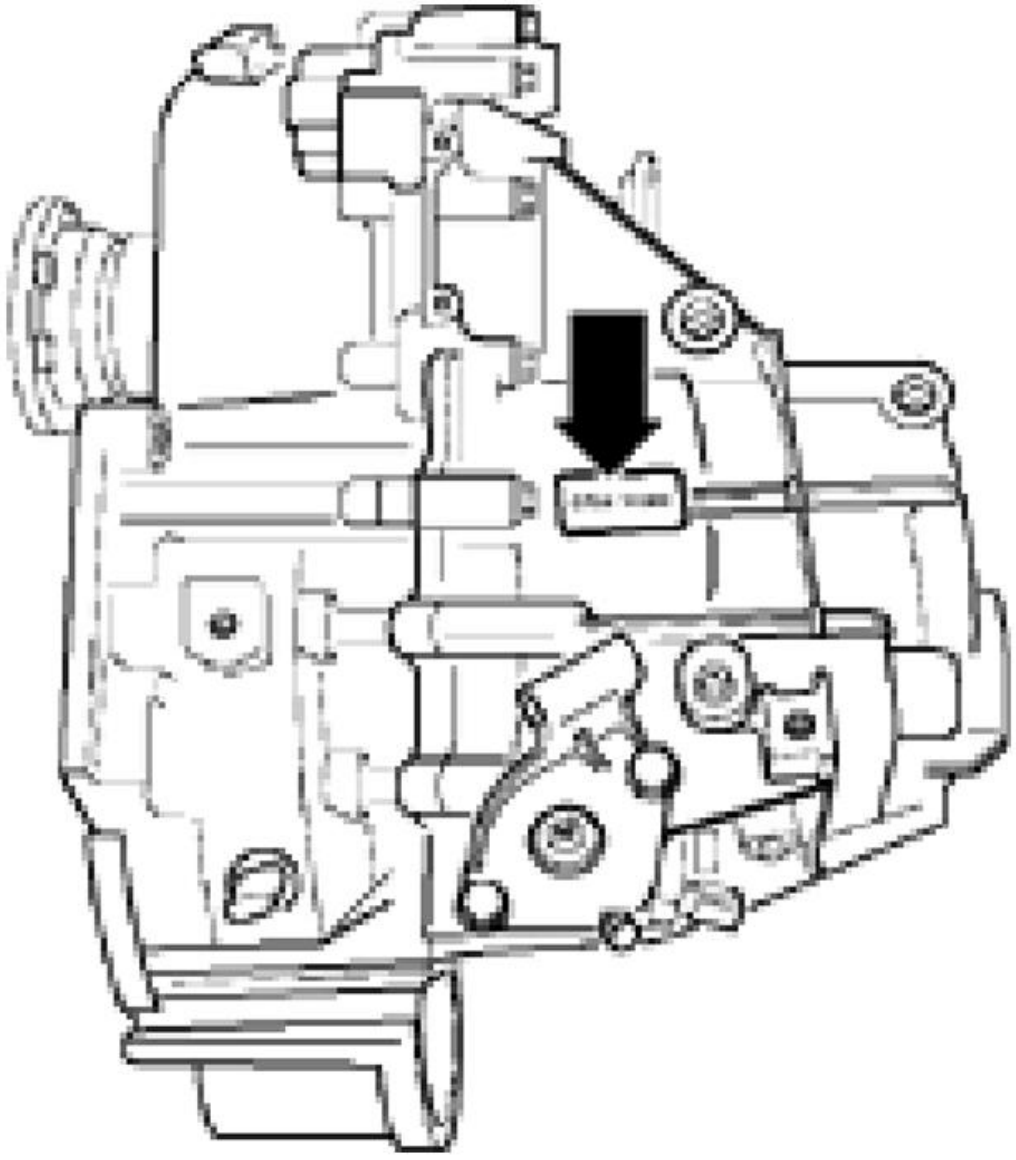
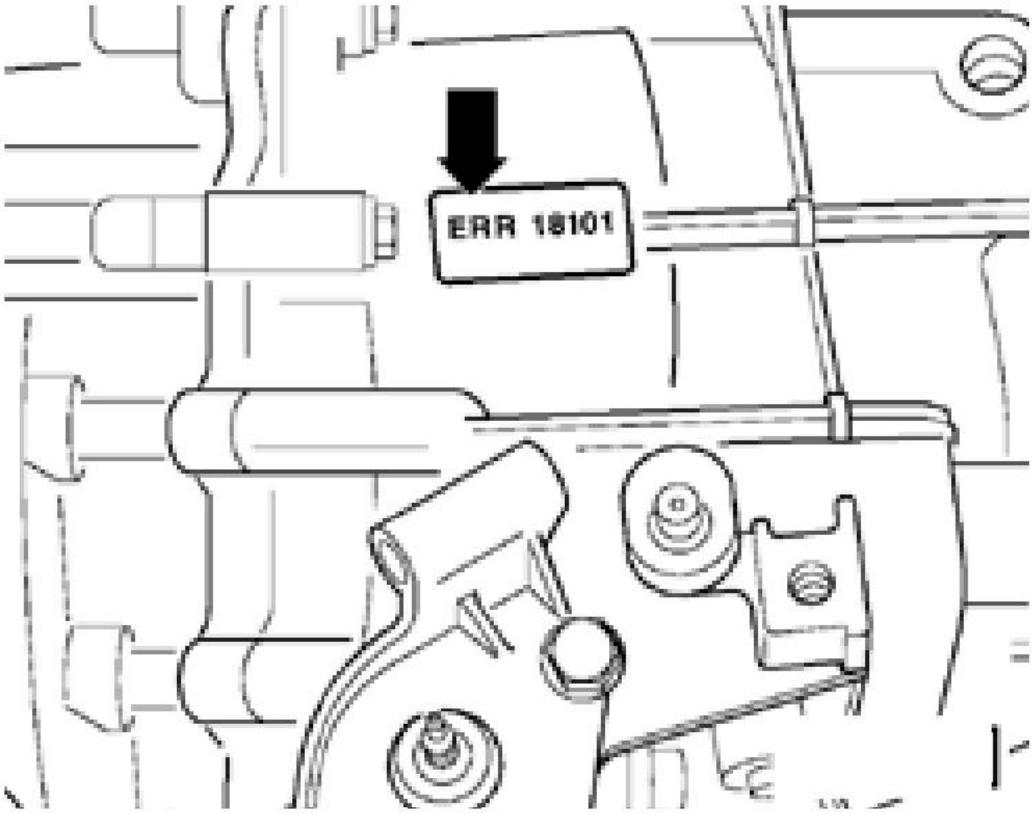


Fig. 1: Locating Code Letters And Date Of Manufacture
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Code letters and date of transmission manufacture

Code letters and date of transmission manufacture (arrow in **Fig. 2** .)



G03257971

Fig. 2: Locating Code Letters And Date Of Transmission Manufacture
Courtesy of VOLKSWAGEN OF AMERICA, INC.

CODE LETTERS AND DATE OF TRANSMISSION MANUFACTURE (EXAMPLE)

ERR	18	10	1
Code letters	Day	Month	Year (2001) of manufacture

Additional data depends on manufacture.

NOTE: The transmission code letters are also shown on the vehicle identification plates.

Code letters, application, ratios, capacities

CODE LETTERS, APPLICATION & RATIOS

Transmission		**5- and 6-speed 02M**
Engine codes		**ERR**
Manufactured	from to	10.01
Application	Model	**New Beetle from 1998 and up**
Application	Engine	1.8 ltr. - 132 kW Turbo
Ratios: $Z_2 : Z_1$	Final drive I (1)	62 : 16 = 3.875
	Final drive II (2)	62 : 20 = 3.100
	1st gear	41 : 12 = 3.417
	2nd gear	40 : 19 = 2.105
	3rd gear	40 : 27 = 1.481
	4th gear	38 : 33 = 1.152
	5th gear	35 : 30 = 1.167
	6th gear	32 : 33 = 0.970
Reverse		30 : 12 x 23 : 14 = 4.107
Speedometer		electronic

(1) Final drive for 1st to 4th gears

(2) Final drive for 5th, 6th and reverse gears

CAPACITIES & SPECIFICATIONS

Identification codes	**ERR**
Capacity	2.3 ltr.
Specification	Gear oil G51 SAE 75W90 (synthetic oil)
Clutch control	hydraulic
Clutch disc diameter	240 mm (1)
Drive shaft flange diameter	108 mm
Overall ratio in top gear	3.007

(1) Two-part flywheel

TRANSMISSION LAYOUT

Designation

NOTE: The following list refers to items in Fig. 3 .

1. **Engine**
2. **Clutch**
3. **Transmission**

4. **Input shaft**
5. **Output shaft 5th/6th/reverse gears**
6. **Output shaft 1st-4th gears**
7. **Differential**

Arrows point in direction of travel

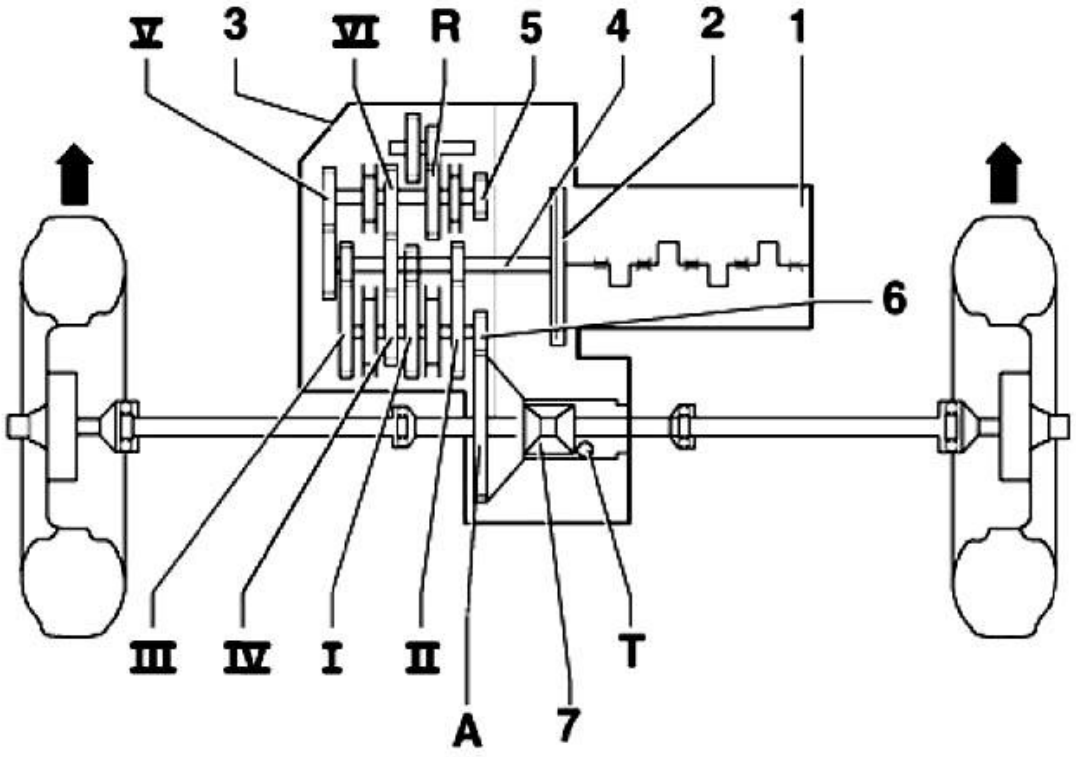


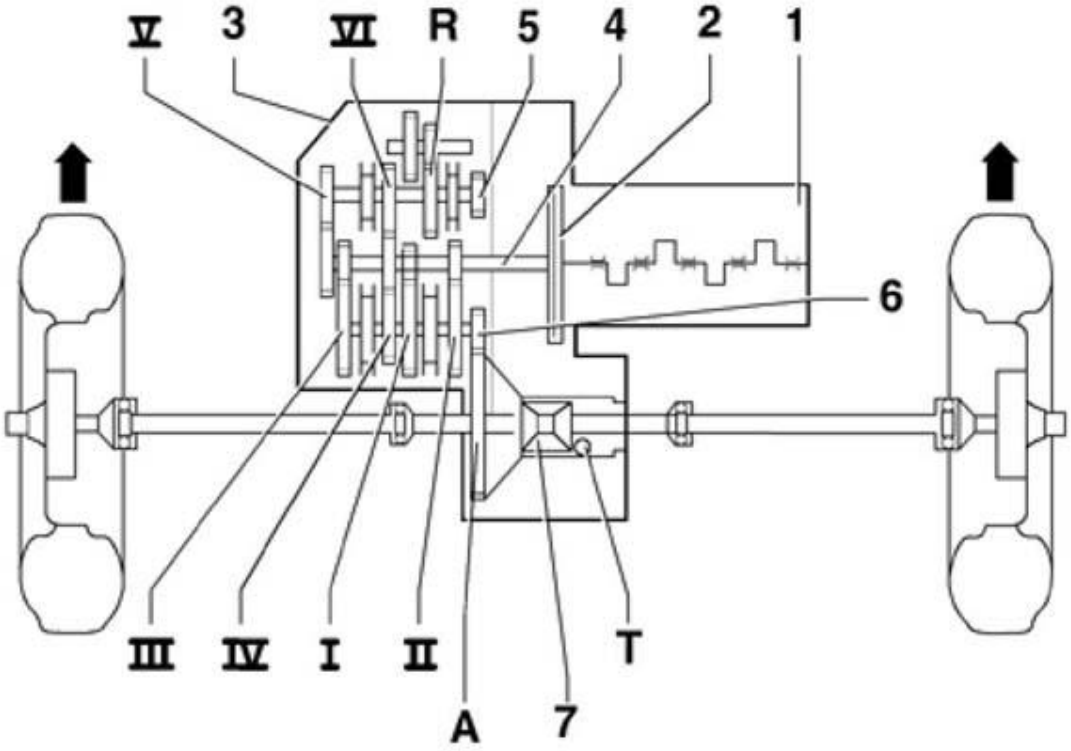
Fig. 3: Identifying Components Of Transmission
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Gear ratios

NOTE: The following list refers to items in Fig. 4 .

I - 1st gear
II - 2nd gear
III - 3rd gear
IV - 4th gear
V - 5th gear
VI - 6th gear
R - Reverse gear
Final drive
T - Speedometer drive

Arrows point in direction of travel



I - 1st gear

II - 2nd gear

III - 3rd gear

IV - 4th gear

V - 5th gear

VI - 6th gear

R - Reverse gear

A - Final drive

T - Speedometer drive

G03257973

Fig. 4: Identifying Gear Location
Courtesy of VOLKSWAGEN OF AMERICA, INC.

CALCULATING OVERALL RATIO "I"

Example:

CALCULATING OVERALL RATIO (EXAMPLE)

Gear	6th gear	Final drive
Drive gear	$ZG_1 = 33$	$ZA_1 = 20$
Driven gear	$ZG_2 = 32$	$ZA_2 = 62$

$_i = Z_2 / Z_1$ (Z_1 = No. of teeth driving gear, Z_2 = No. of teeth driven gear)

i_G = Gear ratio = $ZG_2 : ZG_1 = 32 : 33 = 0.970$

i_A = Axle ratio = $ZA_2 : ZA_1 = 62 : 20 = 3.100$

overall ratio = total ratio = $I_G \times I_A = 0.970 \times 3.100$ 3.007

GENERAL REPAIR INSTRUCTIONS

The maximum possible care, cleanliness and proper tools are essential to ensure satisfactory and successful transmission repairs. The usual basic safety precautions also apply when performing vehicle repairs.

A number of generally valid instructions applicable for the various repair procedures - which were previously repeated a number of times at numerous places in the Repair Manual - are summarized here. They apply to this Repair Manual.

Transmission

- When installing ensure that the dowel sleeves between the engine and the transmission are correctly located.
- When assembling mounting brackets as well as other waxed components the contacts surfaces must be cleaned. Contact surfaces must be free of grease and wax.
- When changing a transmission fill it with gear oil to the lower edge of the filler hole.
- Capacities and specifications. See **CODE LETTERS, APPLICATION, RATIOS, CAPACITIES** .

Gaskets, sealing rings

- Before installing oil seal, fill space between sealing lips with grease G 052 128 A1 -arrows-.

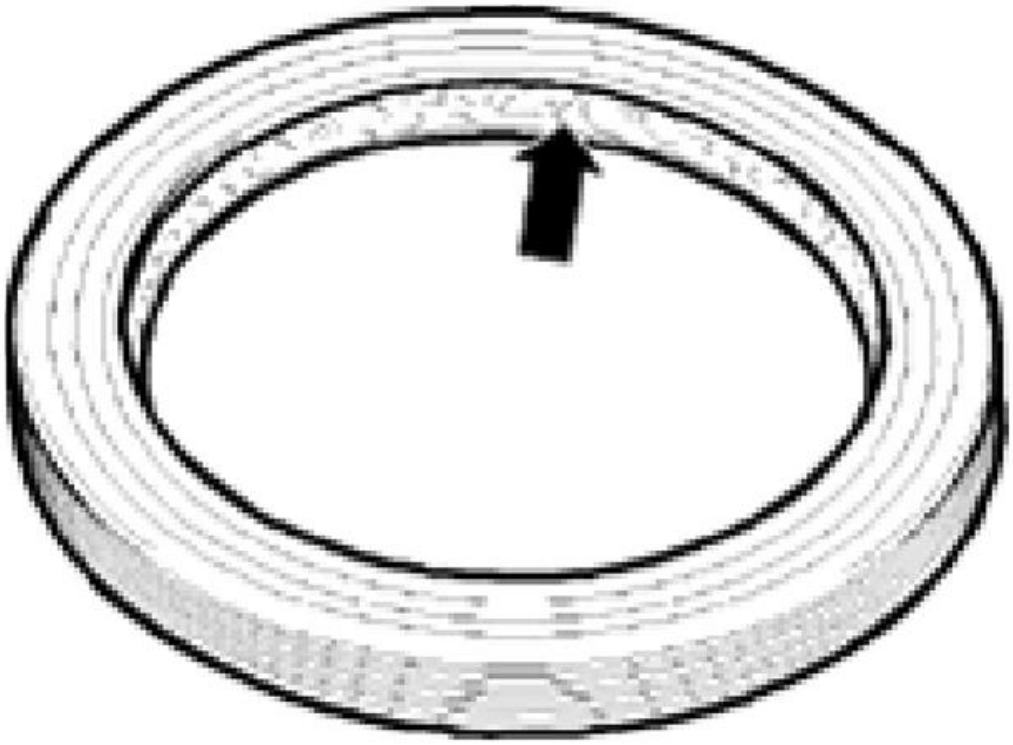


Fig. 5: Identifying Gaskets, Sealing Rings
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- After installing, check oil level. See **CHECKING FLUID LEVEL** .
- Thoroughly clean joint surfaces and apply sealant AMV 188 200 03.
- Apply sealant uniformly but not too thick.
- Replace "O-rings".

Locking devices

- Replace circlips.
- Do not overstretch circlips.
- Circlips must locate properly in the groove.
- Replace spring pins installation position: Slot longitudinal to line of force.

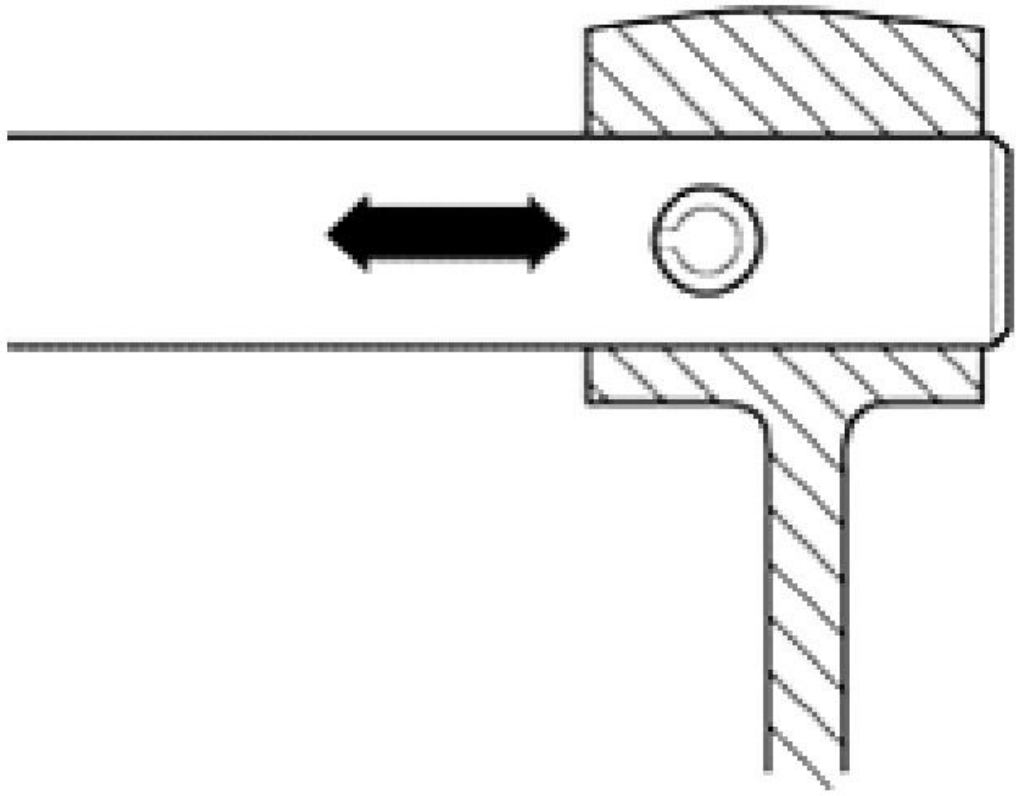


Fig. 6: Identifying Replace Spring Pins Installation Position: Slot Longitudinal To Line Of Force
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Bolts and nuts

- Tighten and loosen bolts and nuts for securing covers and housings in a diagonal sequence.
- Especially delicate parts, such as clutch pressure plates, must not be distorted. Loosen and tighten nuts and bolts in stages in a diagonal sequence.
- Tightening torques as specified are for unoiled bolts and nuts.
- Replace self-locking bolts and nuts.
- Ensure that on bolted connections the areas around the contact surfaces as well as the visible surfaces of nuts and bolts are rewaxed after assembly, if necessary.

Bearings

- Install new tapered roller bearings as supplied and do not lubricate additionally.
- Install needle bearings with lettered side (thicker metal) towards fitting tool.
- Tapered roller bearings fitted to one shaft must be replaced as a set. Use the same make of bearings.
- Heat inner races to approx. 100° C before installing.
- Do not interchange outer or inner races of bearings of the same size. The bearings are matched in pairs.

Shims

- Measure shims at several points with a micrometer. Tolerance variations make it possible to find the exact shim thickness required.
- Check for burrs and damage.
- Only install perfect shims.

Synchronizer rings

- Do not interchange. When reusing always fit to the same gear.
- Check for wear and replace if necessary.
- Coat with gear oil before installing.

Selector gears

- Before installing clean and heat on a hot plate to approx. 100° C.
- Temperature can be checked with temperature tester V.A.G 1558.

MANUAL TRANSMISSION - CONTROLS, HOUSING

TRANSMISSION, DISASSEMBLING AND ASSEMBLING

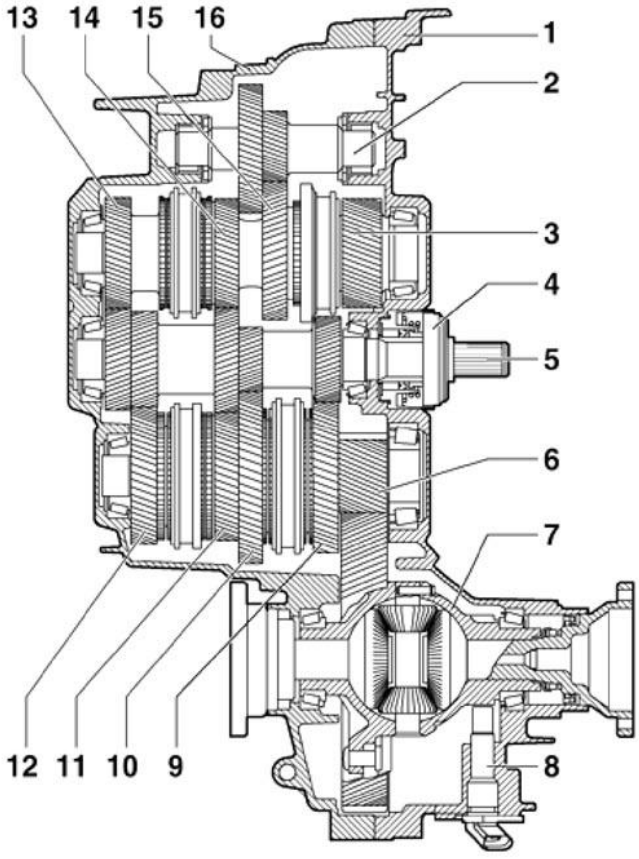
Sequence for disassembling and assembling. See ASSEMBLY SEQUENCE .

Component overview

NOTE: The following list refers to items in Fig. 7 .

1. **Clutch housing**
2. **Reverse shaft**
3. **Output shaft for 5th, 6th and reverse gear**
4. **Slave cylinder with release bearing**
5. **Input shaft**
6. **Output shaft for 1st-4th gear**
7. **Differential**
8. **Speedometer sender**

9. **2nd gear**
10. **1st selector gear**
11. **Selector gear for 4th gear**
12. **Selector gear for 3rd gear**
13. **Selector gear for 5th gear**
14. **6th gear**
    - Spacer sleeve fitted in 5-speed transmission
15. **Reverse sliding gear**
16. **Transmission housing**



1 - Clutch housing
2 - Reverse shaft
3 - Output shaft for 5th, 6th and reverse gear
4 - Slave cylinder with release bearing
5 - Input shaft
6 - Output shaft for 1st-4th gear
7 - Differential
8 - Speedometer sender
9 - 2nd gear
10 - 1st selector gear
11 - Selector gear for 4th gear
12 - Selector gear for 3rd gear
13 - Selector gear for 5th gear
14 - 6th gear
15 - Reverse sliding gear
16 - Transmission housing

G03257976

Fig. 7: Sectional View Of Transmission Components
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Assembly overview

NOTE: The following list refers to items in Fig. 8 .

I. **Disassembling and assembling transmission housing and selector mechanism. See TRANSMISSION HOUSING AND SELECTOR MECHANISM, REMOVING AND INSTALLING** .

II. **Disassembling and assembling input shaft, output shafts, differential and selector rods. See INPUT SHAFT, OUTPUT SHAFTS (PINION SHAFTS), DIFFERENTIAL AND SELECTOR RODS, DISASSEMBLING AND ASSEMBLING** .

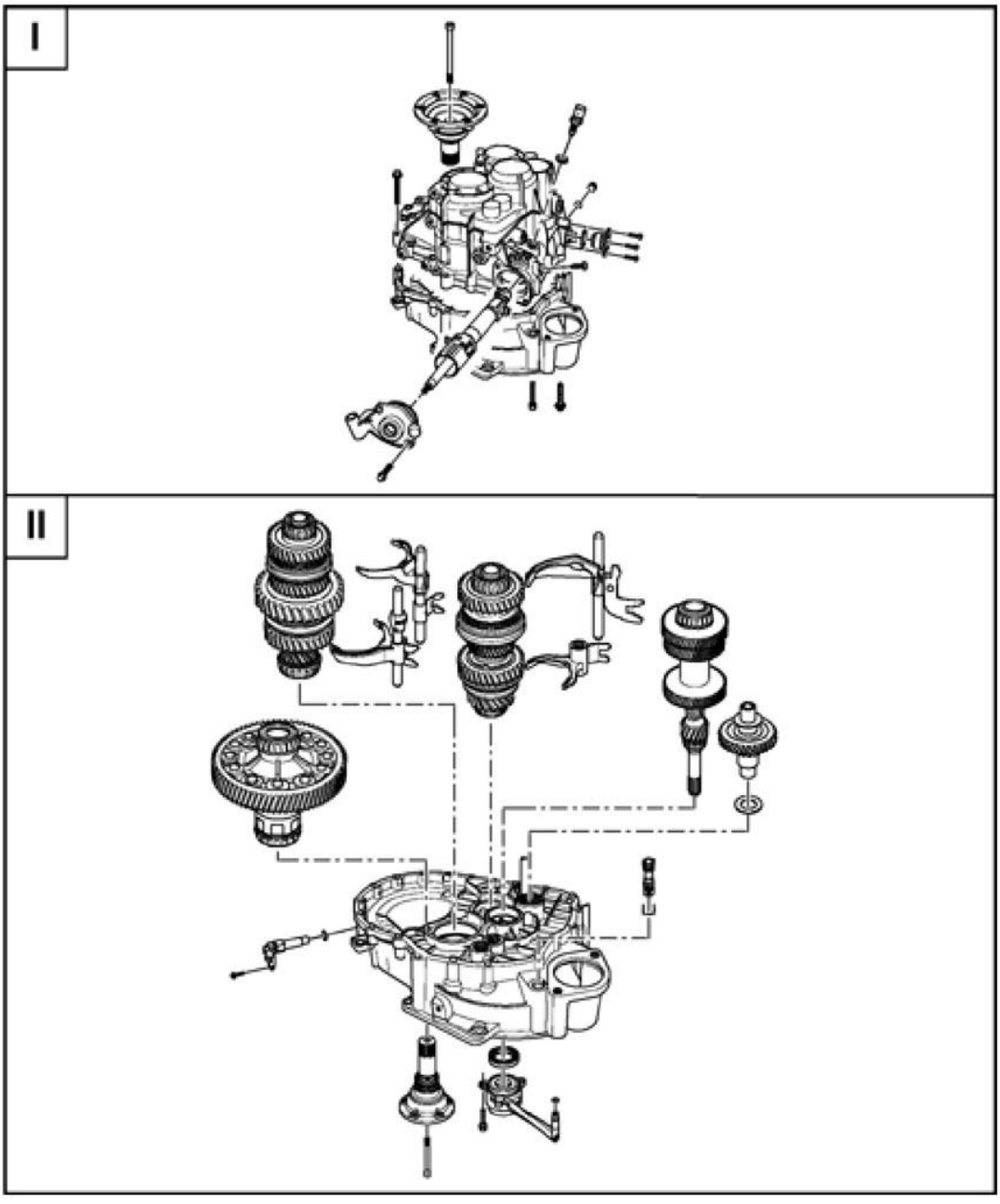


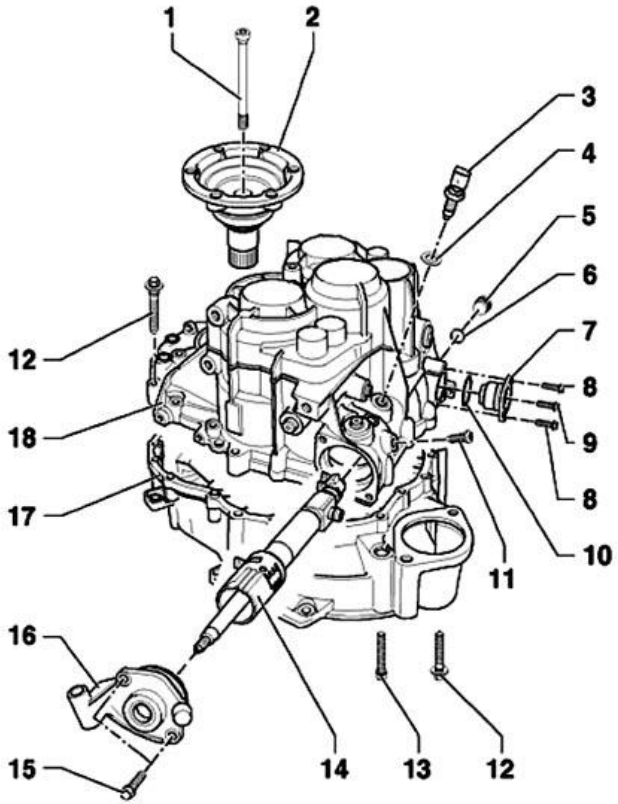
Fig. 8: Transmission Housing And Selector Mechanism Assembly Overview
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Transmission housing and selector mechanism, removing and installing

NOTE: The following list refers to items in Fig. 9 .

1. **Countersunk head bolt, 25 N.m**
2. **Flanged shaft with spring**
   - Removing and installing. See **OIL SEALS FOR FLANGED SHAFTS, REPLACING**
   - Assembling. See **Differential, disassembling and assembling**
3. **Back-up light switch, 20 N.m**
4. **Oil seal**
   - Always replace
5. **Oil drain plug, 30 N.m**
   - Always replace
6. **Oil seal**
   - Always replace
7. **Cover plate**
8. **Hex bolt, 20 N.m**
   - Always replace
9. **Hex bolt, 20 N.m**
   - For selector shaft - item 14 - to cover plate
   - Always replace
10. **O-ring**
    - Always replace
    - Insert in groove in cover plate
11. **Locking bolt, 15 N.m**
    - For selector shaft gate
    - Always replace
    - Insert with locking fluid D 000 600 A2
12. **Hex bolt, 25 N.m and turn 45° further**
    - With attached washer
    - Always replace
13. **Hex bolt, 25 N.m and turn 45° further**
    - Without washer
    - Always replace
14. **Selector shaft**
    - Disassembling and assembling. See **TRANSMISSION SELECTOR MECHANISM, DISASSEMBLING AND ASSEMBLING** .
15. **Hex bolt, 20 N.m**
    - Always replace
16. **Selector mechanism cover**
    - Disassembling and assembling. See **TRANSMISSION SELECTOR MECHANISM, DISASSEMBLING AND ASSEMBLING** .

17. **Clutch housing**
    - Servicing. See **CLUTCH HOUSING, SERVICING** .
18. **Transmission housing**
    - Servicing. See **TRANSMISSION HOUSING, SERVICING** .



1 - Countersunk head bolt, 25 Nm

2 - Flanged shaft with spring

3 - Back-up light switch, 20 Nm

4 - Oil seal

5 - Oil drain plug, 30 Nm

6 - Oil seal

7 - Cover plate

8 - Hex bolt, 20 Nm

9 - Hex bolt, 20 Nm

10 - O-ring

11 - Locking bolt, 15 Nm

12 - Hex bolt, 25 Nm and turn 45° further

13 - Hex bolt, 25 Nm and turn 45° further

14 - Selector shaft

15 - Hex bolt, 20 Nm

16 - Selector mechanism cover

17 - Clutch housing

18 - Transmission housing

G03257978

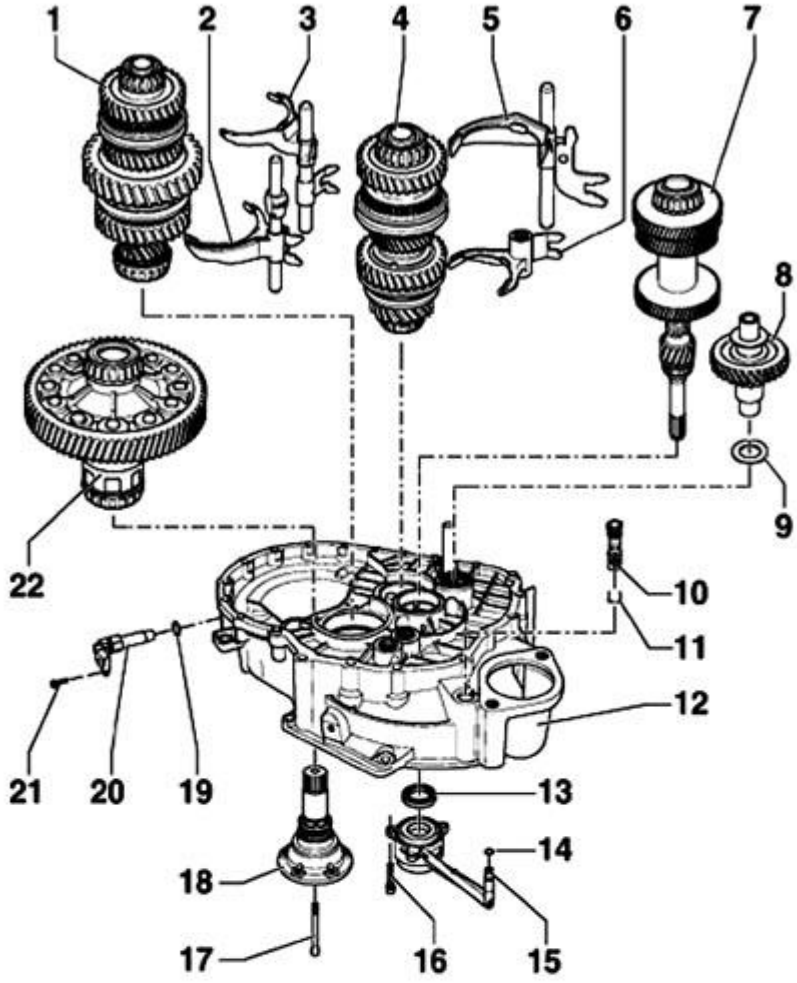
Fig. 9: Removing And Installing Of Transmission Housing And Selector Mechanism
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Input shaft, output shafts (pinion shafts), differential and selector rods, disassembling and assembling

NOTE: The following list refers to items in Fig. 10 .

1. **Output shaft for 1st-4th gear**
   - Disassembling and assembling. See **Output shaft, 1st-4th gear, disassembling and assembling** .
   - Installation position. See **Installation position of output shafts (pinion shafts) in transmission** .
2. **Selector rod with selector fork 1st and 2nd gear**
   - Installation position. See **Installation position of complete selector mechanism in transmission** .
3. **Selector rod with selector fork for 3rd and 4th gear**
   - Installation position. See **Installation position of complete selector mechanism in transmission** .
4. **Output shaft for 5th, 6th and reverse gear**
   - Disassembling and assembling. See **Output shaft for 5th, 6th and reverse gear, disassembling and assembling** .
   - Installation position. See **Installation position of output shafts (pinion shafts) in transmission** .
5. **Selector rod with selector fork for 5th and 6th gear**
   - Installation position. See **Installation position of complete selector mechanism in transmission** .
6. **Reverse gear selector fork**
   - Installation position. See **Installation position of complete selector mechanism in transmission** .
7. **Input shaft**
   - Disassembling and assembling. See **Input shaft, disassembling and assembling** .
8. **Reverse shaft**
   - Removing and installing. See **ASSEMBLY SEQUENCE** .
9. **Thrust washer**
10. **Bleeder**
    - Bolt to slave cylinder pipe
11. **Clip**
12. **Clutch housing**
13. **Input shaft oil seal**
14. **O-ring**
    - Replace
15. **Slave cylinder with release bearing**
16. **Hex bolt, 12 N.m**
    - Qty. 3
17. **Cone head bolt, 25 N.m**
18. **Flange shaft with spring**
    - Removing and installing. See **OIL SEALS FOR FLANGED SHAFTS, REPLACING** .
    - Assembling. See from **Differential, disassembling and assembling** .
19. **O-ring**
    - Always replace

20. **Speedometer sender**
21. **Hex bolt, 12 N.m**
22. **Differential**
    - Disassembling and assembling. See **Differential, disassembling and assembling** .



1 - Output shaft for 1st-4th gear

2 - Selector rod with selector fork 1st and 2nd gear

3 - Selector rod with selector fork for 3rd and 4th gear

4 - Output shaft for 5th, 6th and reverse gear

5 - Selector rod with selector fork for 5th and 6th gear

6 - Reverse gear selector fork

7 - Input shaft

8 - Reverse shaft

9 - Thrust washer

10 - Bleeder

11 - Clip

12 - Clutch housing

13 - Input shaft oil seal

14 - O-ring

15 - Slave cylinder with release bearing

16 - Hex bolt, 12 Nm

17 - Cone head bolt, 25 Nm

18 - Flange shaft with spring

19 - O-ring

20 - Speedometer sender

21 - Hex bolt, 12 Nm

22 - Differential

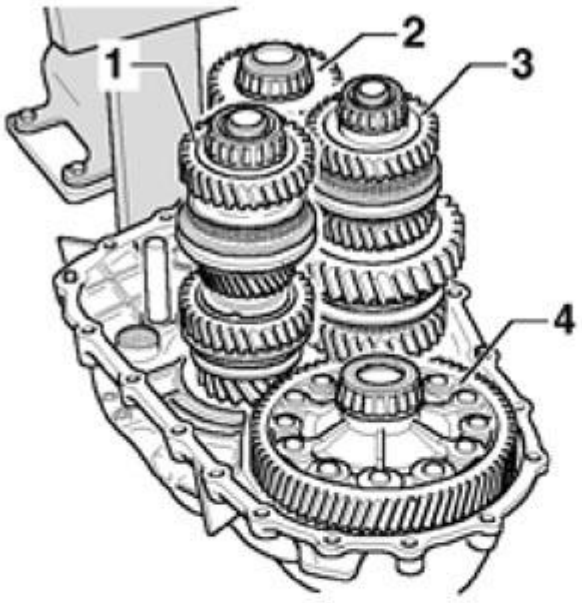
G03257979

Fig. 10: Identifying Input Shaft, Output Shafts (Pinion Shafts), Differential And Selector Rods
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Installation position of output shafts (pinion shafts) in transmission

NOTE: The following list refers to items in Fig. 11 .

1. Output shaft for 5th/6th and reverse gear
2. Input shaft
3. Output shaft for 1st-4th gear
4. Differential



1 - Output shaft for 5th/6th and reverse gear

2 - Input shaft

3 - Output shaft for 1st-4th gear

4 - Differential

G03257980

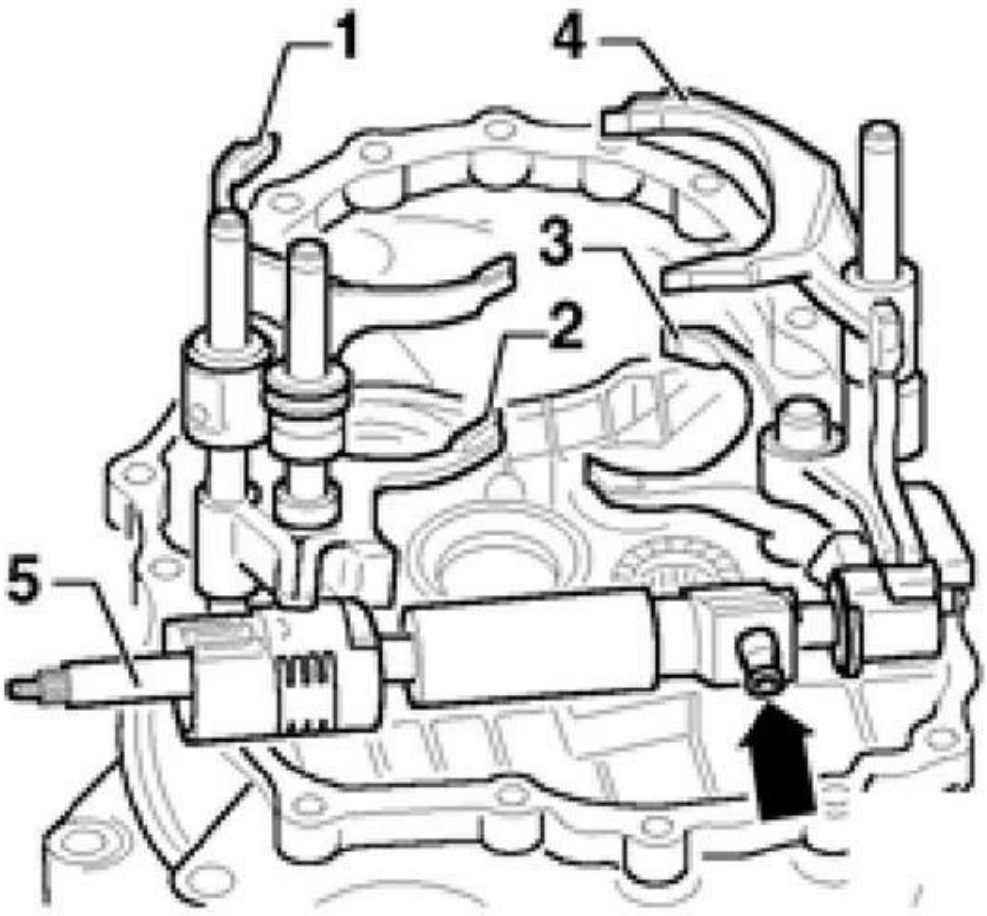
Fig. 11: Identifying Installation Position Of Output Shafts (Pinion Shafts) In Transmission
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Installation position of complete selector mechanism in transmission

NOTE: The following list refers to items in Fig. 12 .

1. 3rd and 4th gear selector fork
2. 1st and 2nd gear selector fork
3. Reverse gear selector fork
4. 5th and 6th gear selector fork
5. Selector shaft

The lower selector shaft mounting -arrow- is bolted to the cover plate.



1 - 3rd and 4th gear selector fork

2 - 1st and 2nd gear selector fork

3 - Reverse gear selector fork

4 - 5th and 6th gear selector fork

5 - Selector shaft

G03257981

Fig. 12: Identifying Installation Position Of Complete Selector Mechanism In Transmission
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Assembly sequence

Disassembling and assembling transmission housing, selector mechanism, input shaft, output shafts, differential and selector rods

Special tools and equipment

- VW 309 Holding plate
- VW 313 Support clamp
- VW 353 Transmission support
- 30-21 Sleeve
- T40008 Press piece

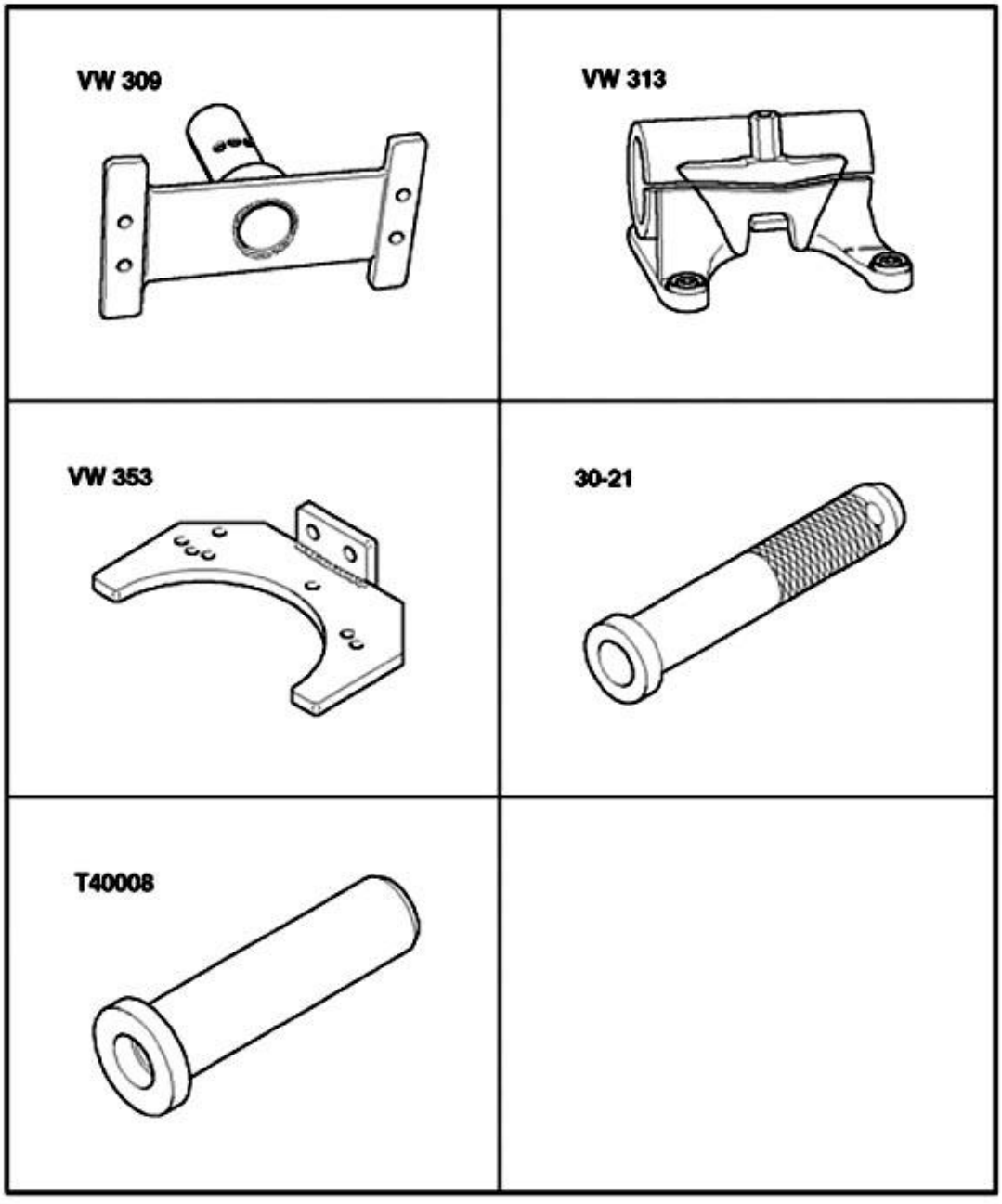


Fig. 13: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Disassembling

- Secure transmission to assembly support with bolts -arrows-.

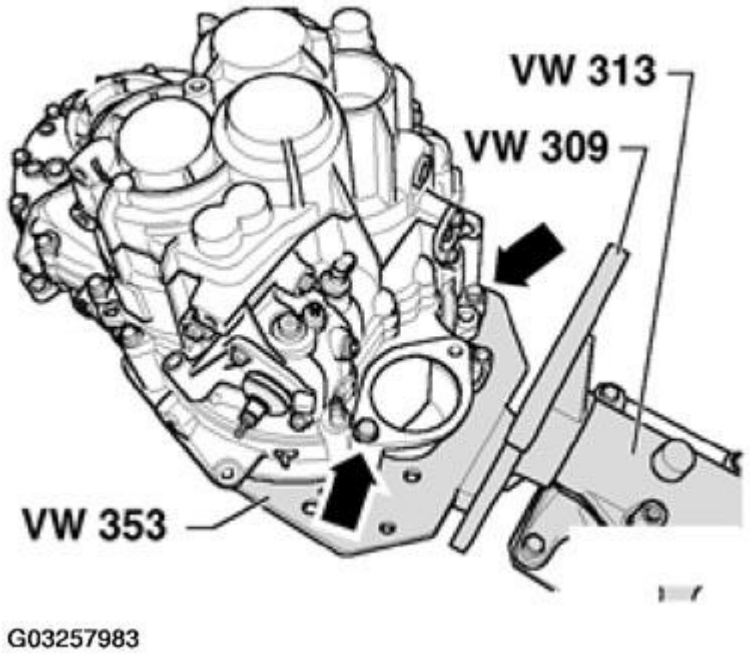


Fig. 14: Securing Transmission To Assembly Support With Bolts
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Turn transmission on assembly support with oil drain plug downward.
- Place drip tray underneath.
- Drain transmission oil.
- Remove slave cylinder with release bearing -arrows-.

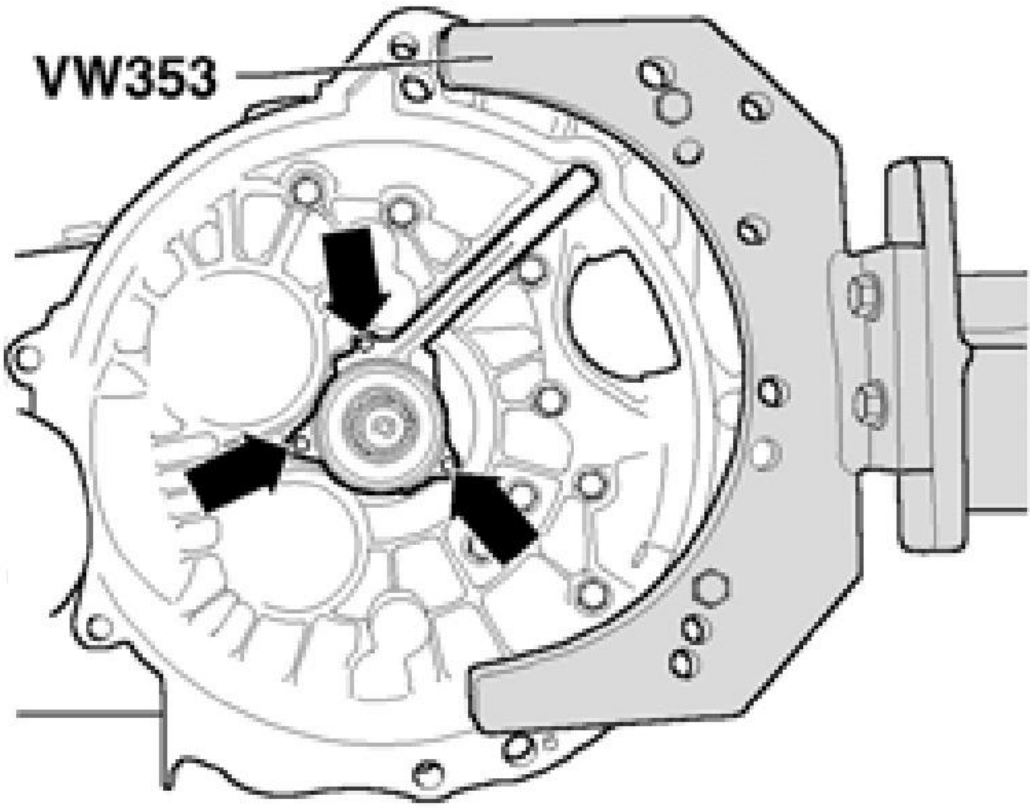


Fig. 15: Removing Slave Cylinder With Release Bearing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Put selector shaft in neutral position.
- Remove back-up light switch -1-.
- Remove hex bolts -2- for selector shaft cover plate -A-.
- Carefully pull out cover plate.
- Remove locking bolt -3- for selector shaft gate.
- Remove bolts -4- and press selector shaft cover -B- out of transmission housing.

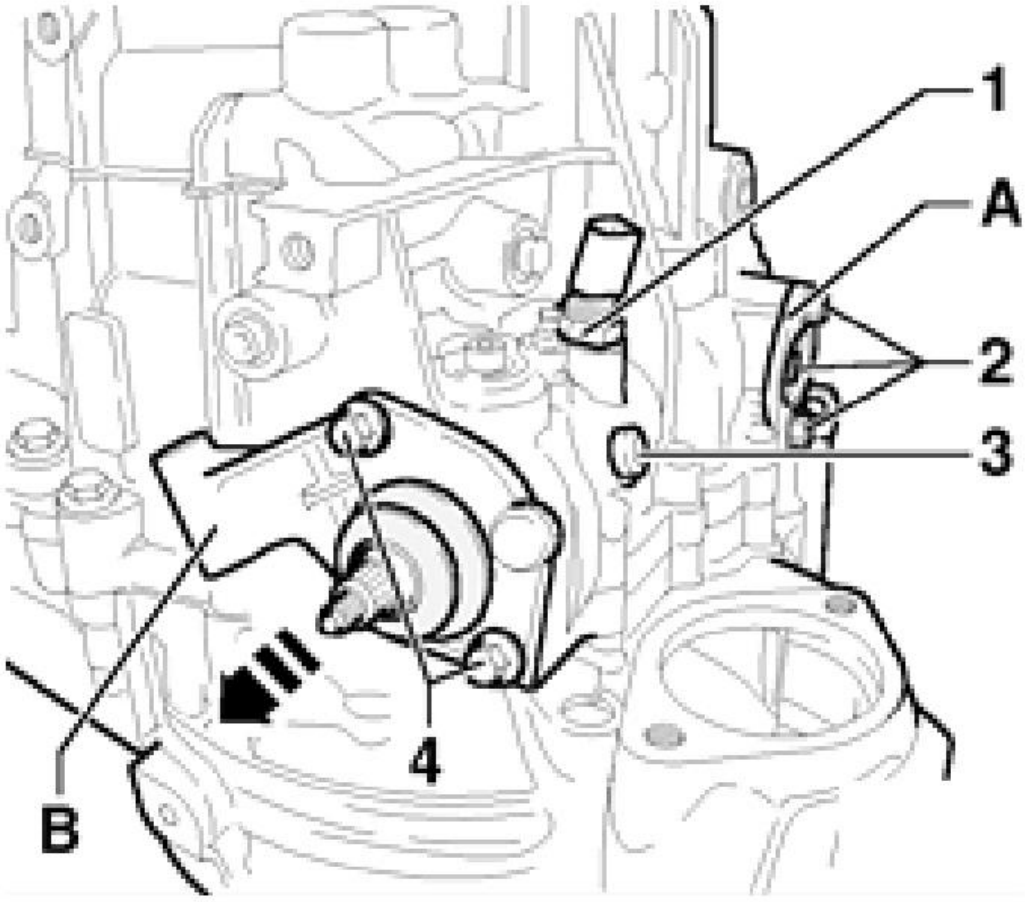


Fig. 16: Removing Bolts -4- And Pressing Selector Shaft Cover -B- Out Of Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Pull selector shaft out of transmission housing.
- Remove both flange shafts.
- Remove bolts securing transmission housing to clutch housing -A- in area of differential.

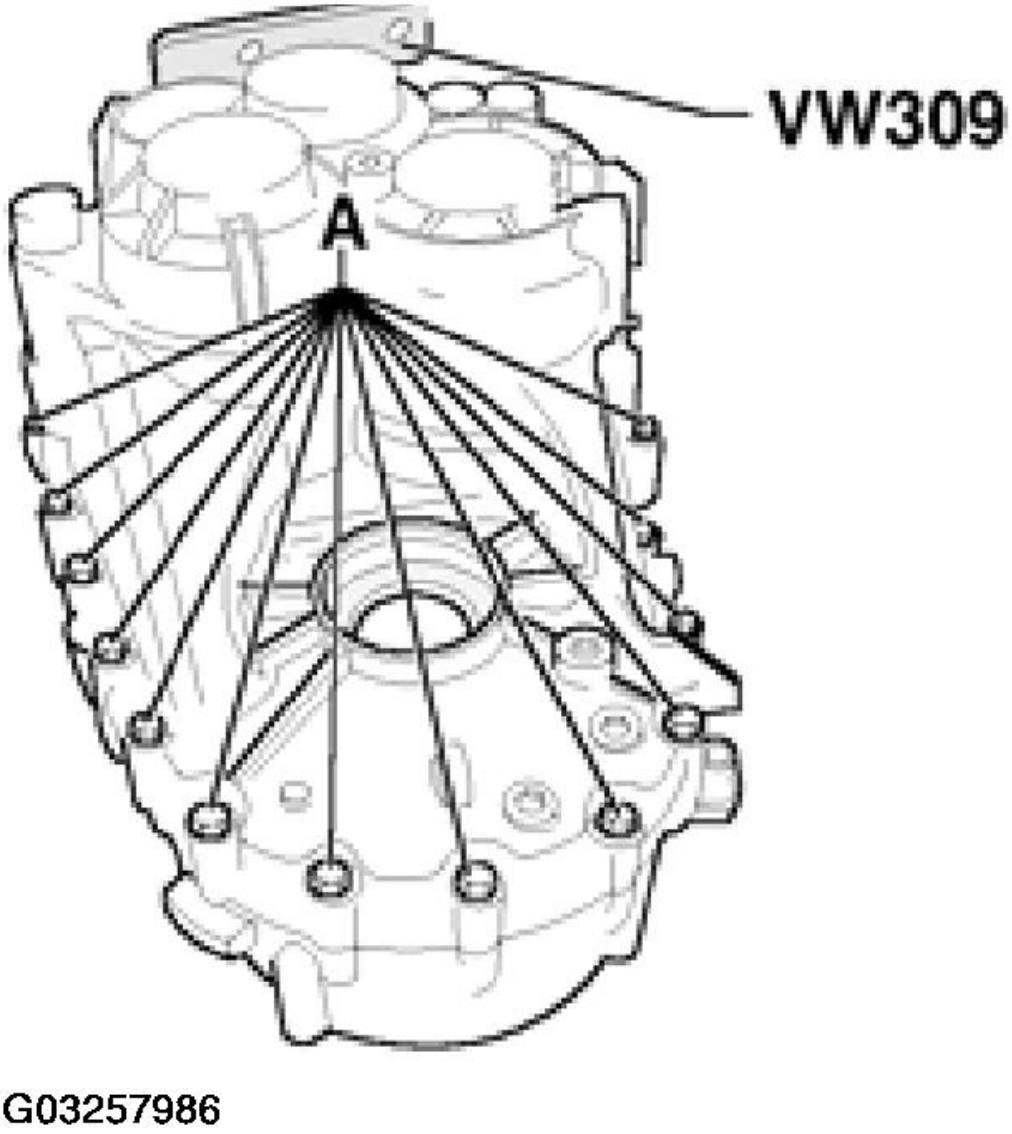


Fig. 17: Removing Bolts Securing Transmission Housing To Clutch Housing -A- In Area Of Differential
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove bolts -B- inside clutch housing for securing clutch housing to transmission housing.

NOTE: The hex bolt -arrow- is located outside the bolting flange. It is fitted with a washer.

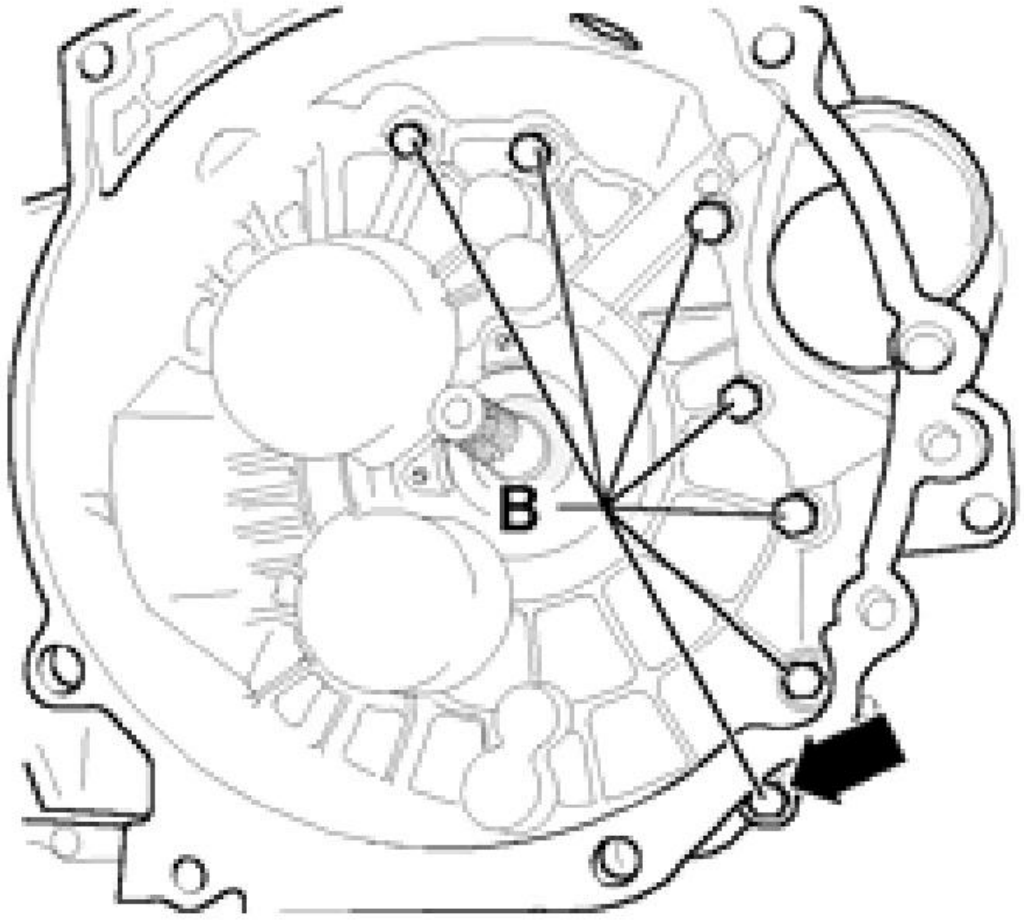


Fig. 18: Removing Bolts -B- Inside Clutch Housing For Securing Clutch Housing To Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Take off transmission housing. If necessary, carefully pry up all around and alternating between sides on protruding flange taking care not to damage sealing surfaces.
- Swing input shaft in direction of arrow and take off.

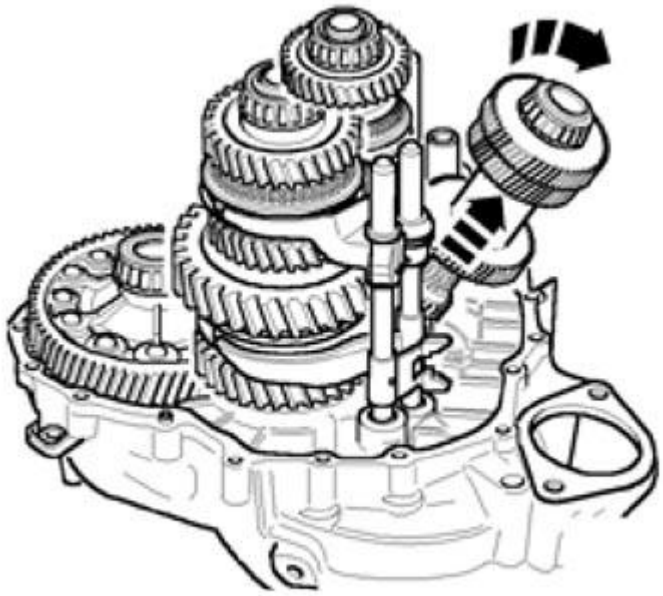


Fig. 19: Swing Input Shaft In Direction Of Arrow And Take Off
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove speedometer drive.
- With help of a second mechanic, remove differential -1-, output shafts -2- and -3-, reverse shaft -4- and selector rods -5- together from clutch housing.

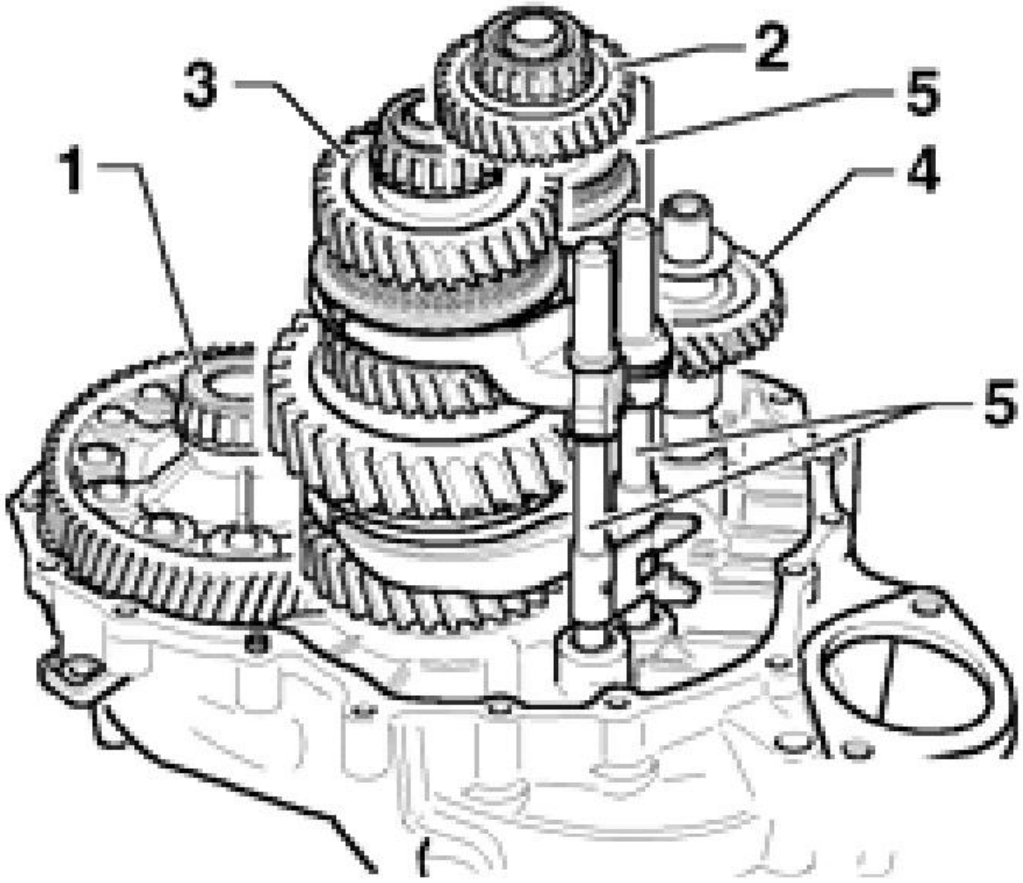


Fig. 20: Removing Differential, Output Shafts, Reverse Shaft And Selector Rods Together From Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Drive out input shaft oil seal with sleeve 30-21.

Assembling

- Install differential -1-.
- Install 5th, 6th and reverse gear output shaft -2- together with reverse selector fork, 5th, 6th and reverse gear selector rod -3- and reverse shaft -4-.
- Take 1st-4th gear output shaft -3- with selector rods -5- in right hand as illustrated in **Fig. 21** .

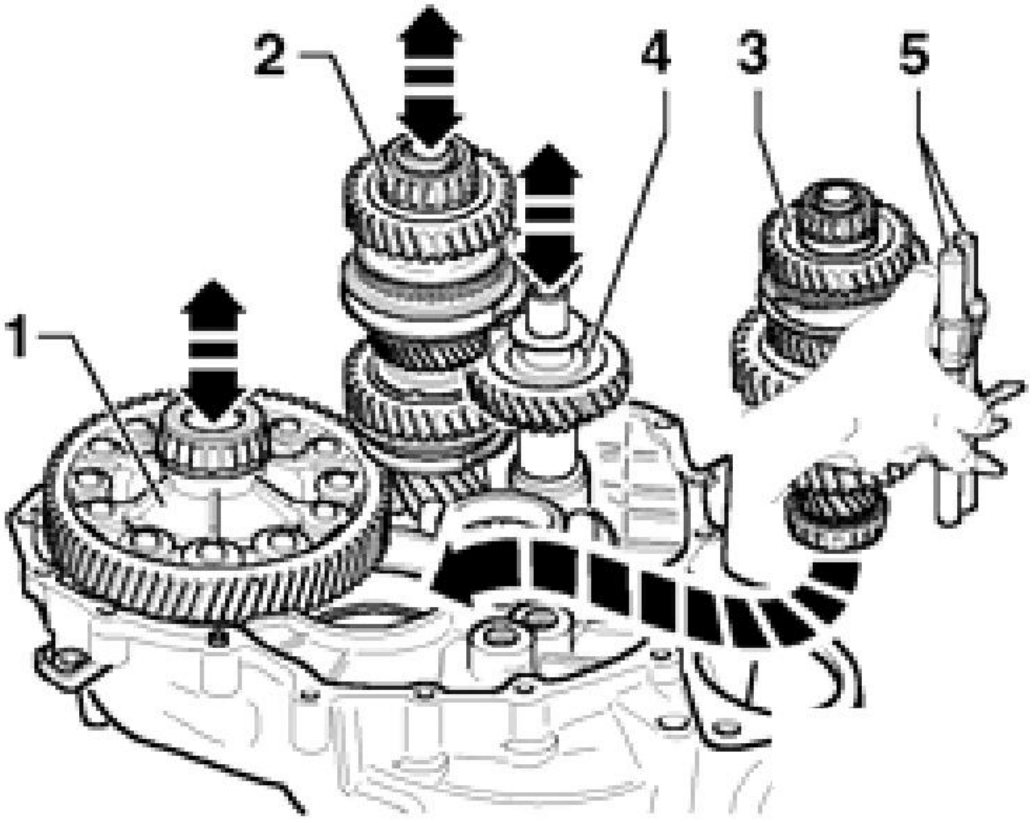


Fig. 21: Removing 1st-4th Gear Output Shaft With Selector Rods In Right Hand
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- With left hand, lift differential slightly.
- At same time, have a second mechanic slightly lift 5th, 6th and reverse gear output shaft together with reverse shaft -4-.
- Insert 1st-4th gear output shaft in direction of arrow.

  Toothing of output shafts and final drive gear/differential must mesh.

- Together with second mechanic, place shafts in their bearing seats.
- Set input shaft in clutch housing and swing in -arrow-.

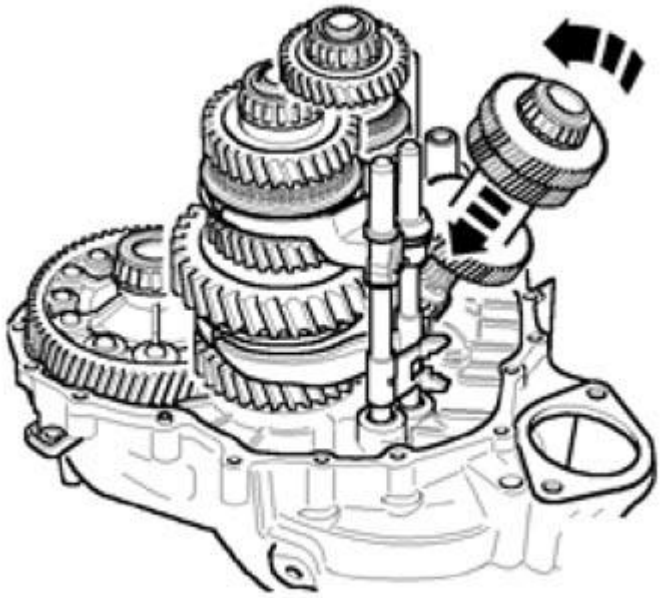
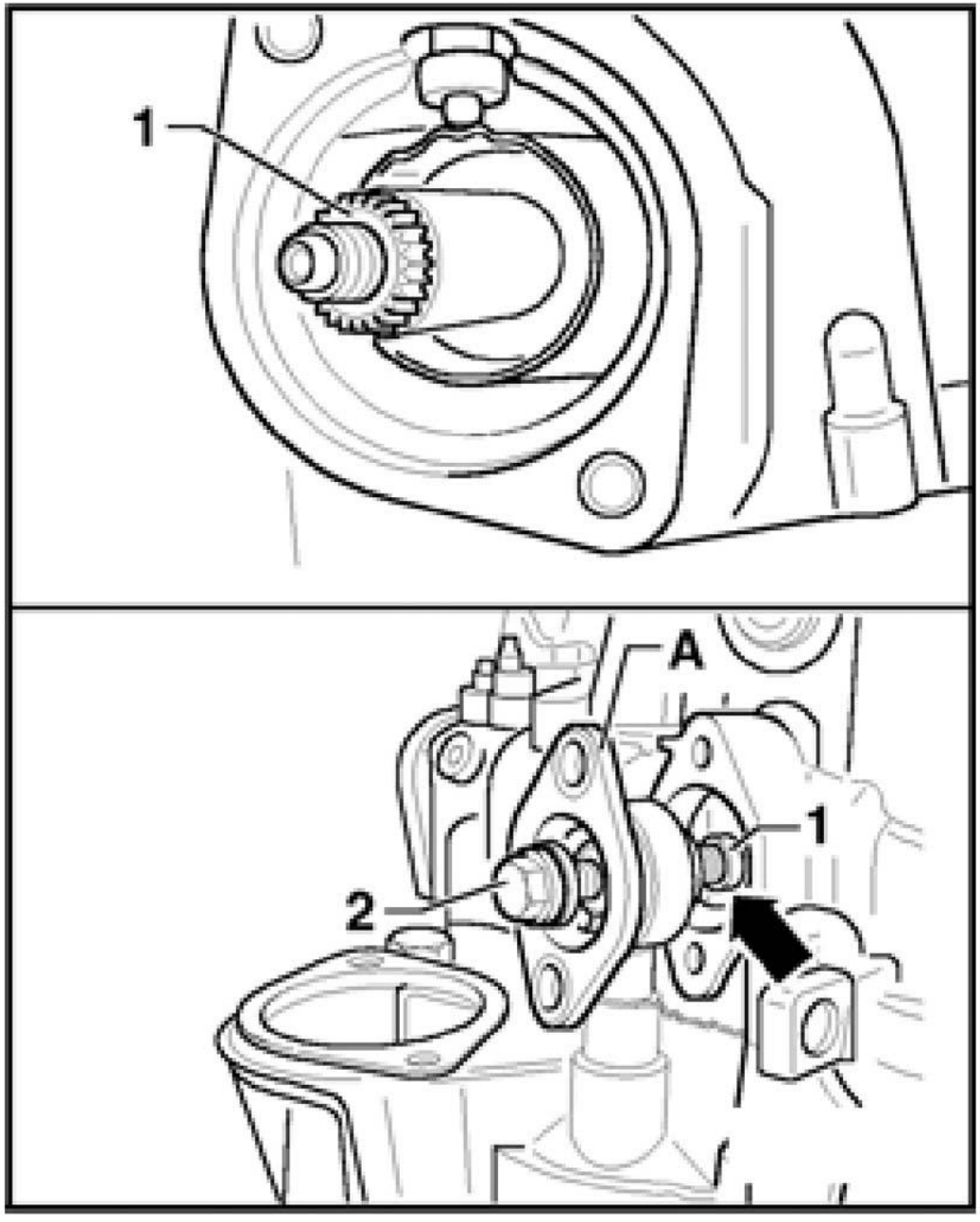


Fig. 22: Setting Input Shaft In Clutch Housing And Swing In
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Fit transmission housing.

Install selector shaft as follows:

- Bring selector rods -A- into neutral.
- Insert selector shaft -1-.



G03257992

Fig. 23: Inserting Selector Shaft
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Position selector shaft so that shift fingers are inserted in selector rods, see **Installation position of**

complete selector mechanism in transmission .

- When doing this, align lower selector shaft bearing -arrow- through drilling for cover plate.
- Bolt cover plate -A- to lower selector shaft bearing -1- with bolt -2-, M8 x 60 mm.
- Hand tighten cover plate -A- by alternately tightening (1/2turn) bolts -arrows-.
- Remove bolt -2- and hand tighten original bolt in its place.
- Install selector shaft cover -B- and tighten hex bolts to torque.
- Tighten cover plate hex bolts.
- Insert locking bolt -3- for selector shaft gate with locking fluid D 000 600 A2.

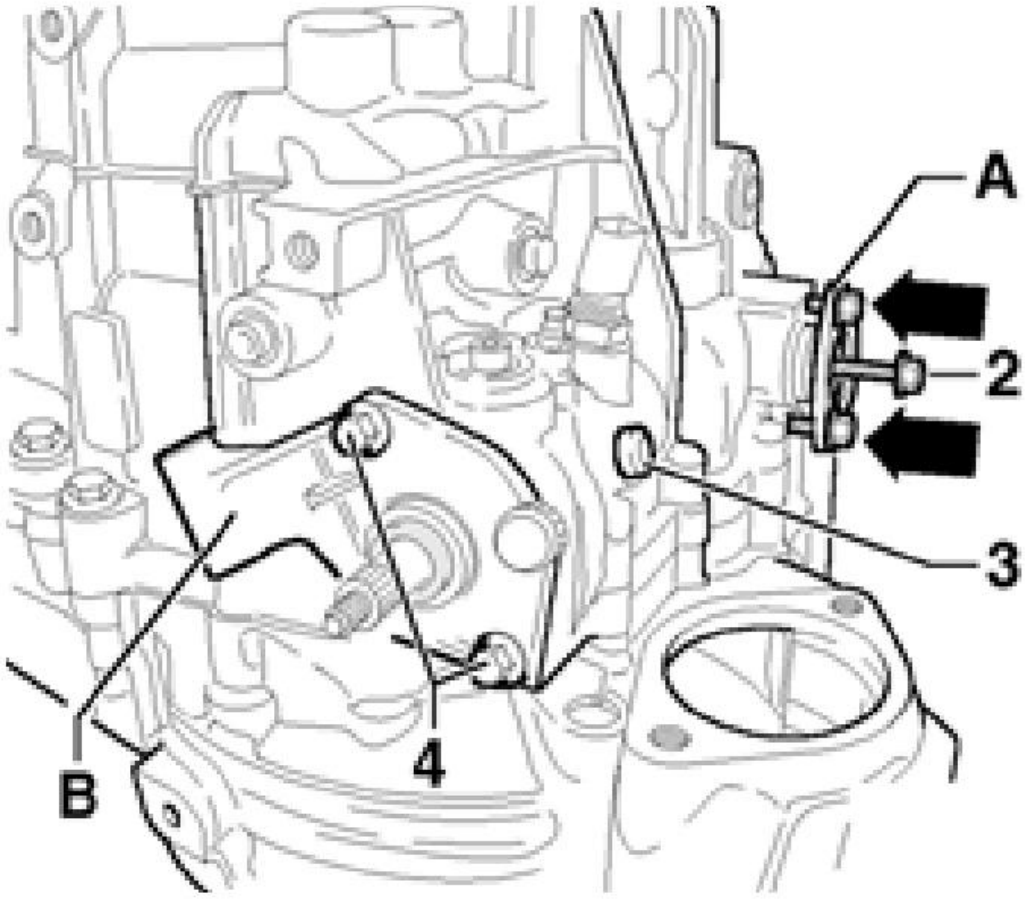


Fig. 24: Tightening Cover Plate -A- By Alternately Tightening (1/2Turn) Bolts
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install switch for back-up light.
- Install flange shafts with springs, thrust washers and tapered rings.
- Install speedometer sender.
- Press in input shaft oil seal.

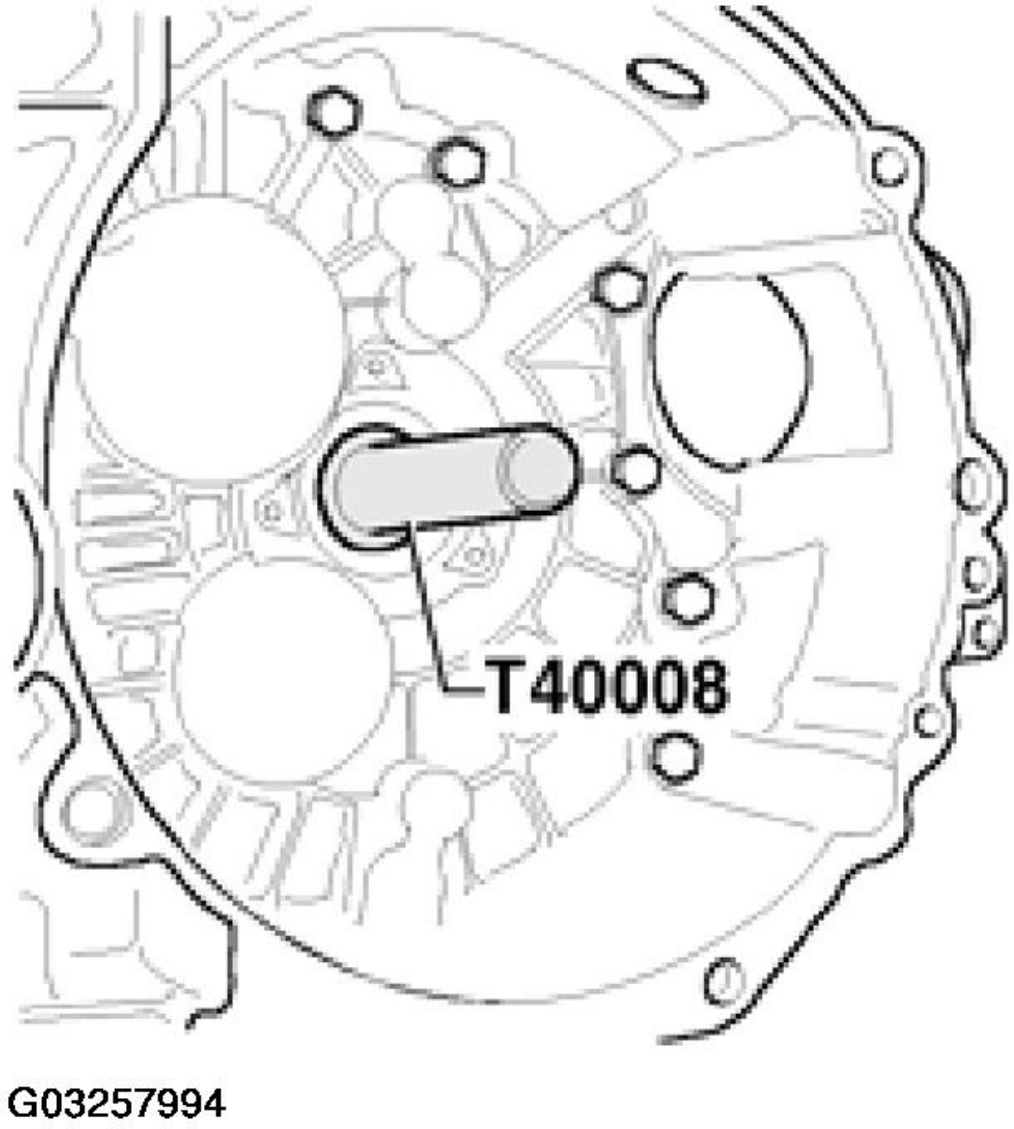


Fig. 25: Installing Slave Cylinder With Release Bearing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install slave cylinder with release bearing.

TRANSMISSION HOUSING, SERVICING

Special tools and equipment

- VW 309 Holding plate
- VW 353 Transmission support
- VW 407 Press tool
- VW 771 Multipurpose tool
- 12-551 Centering mandrel
- 3129 Installation tool

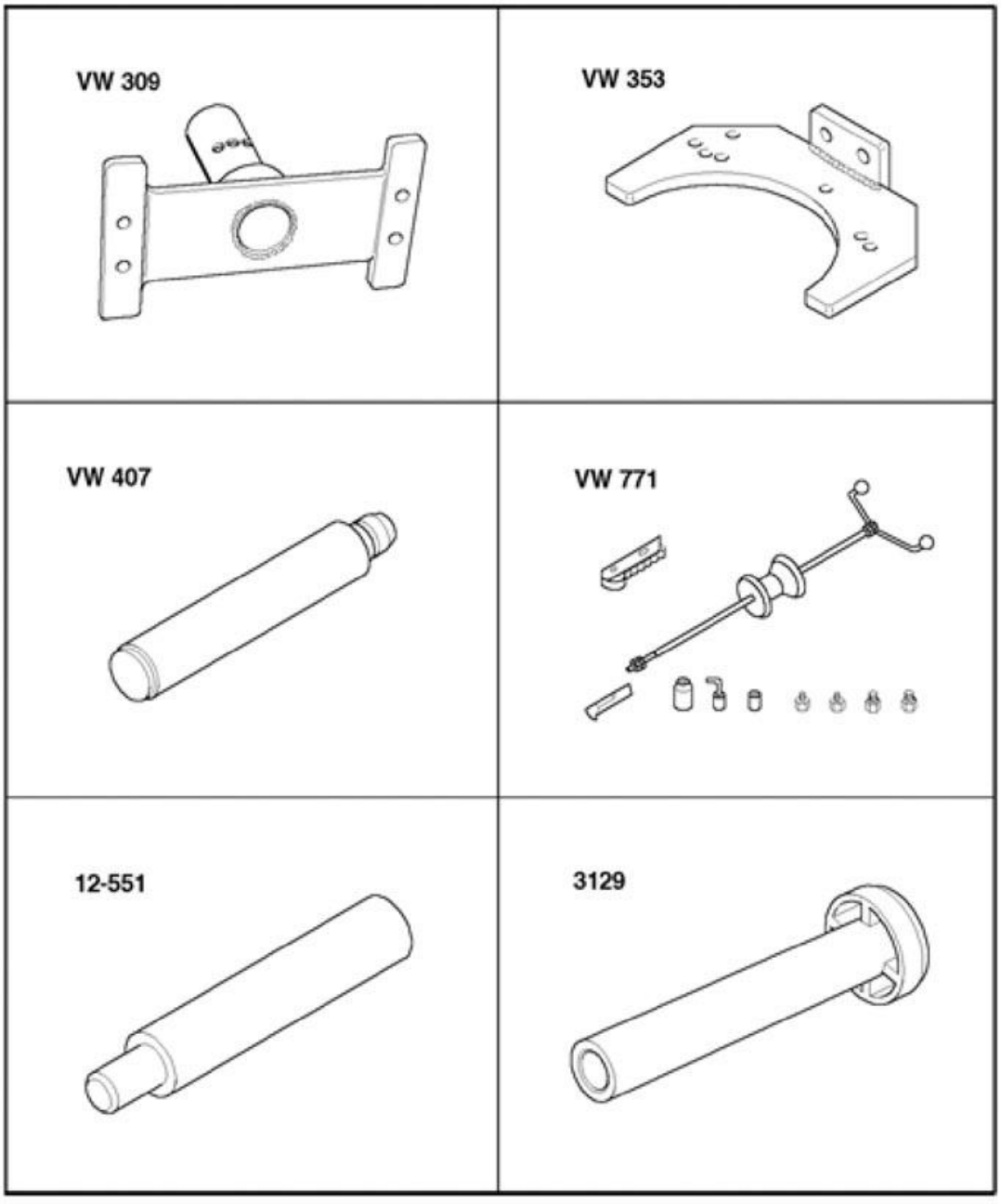


Fig. 26: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 3176 Centering mandrel

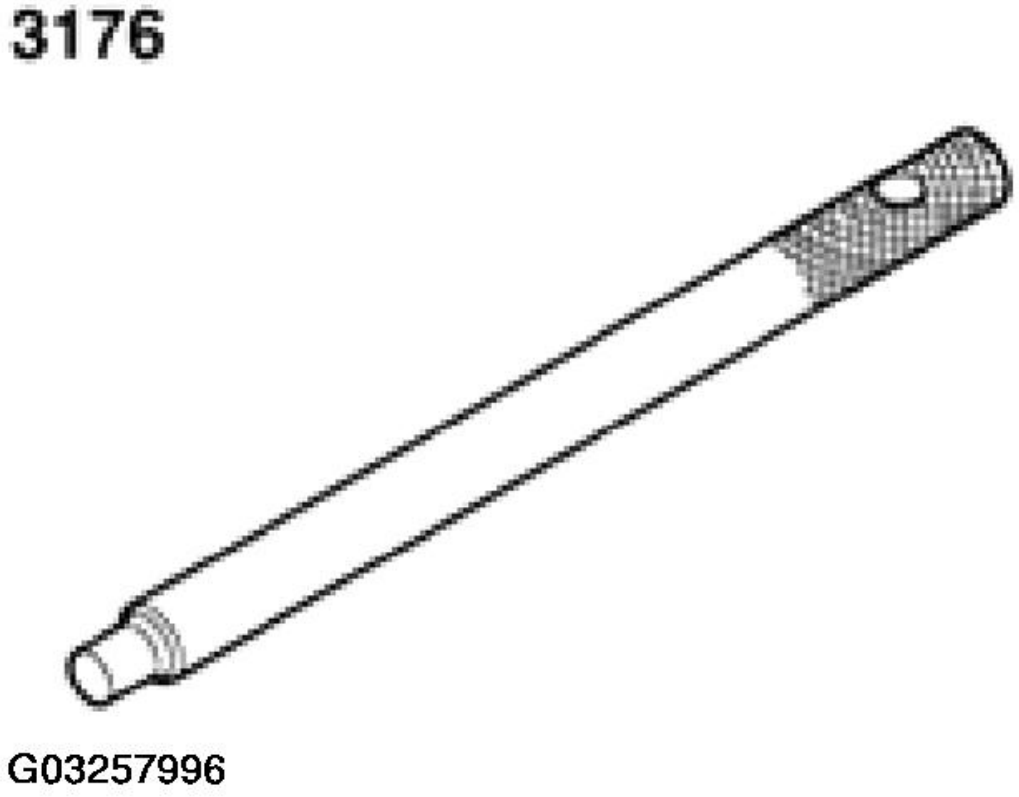


Fig. 27: Identifying 3176 Centering Mandrel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 1 - Kukko 21/2 Internal puller
- 1 - Internal puller Kukko 21/4

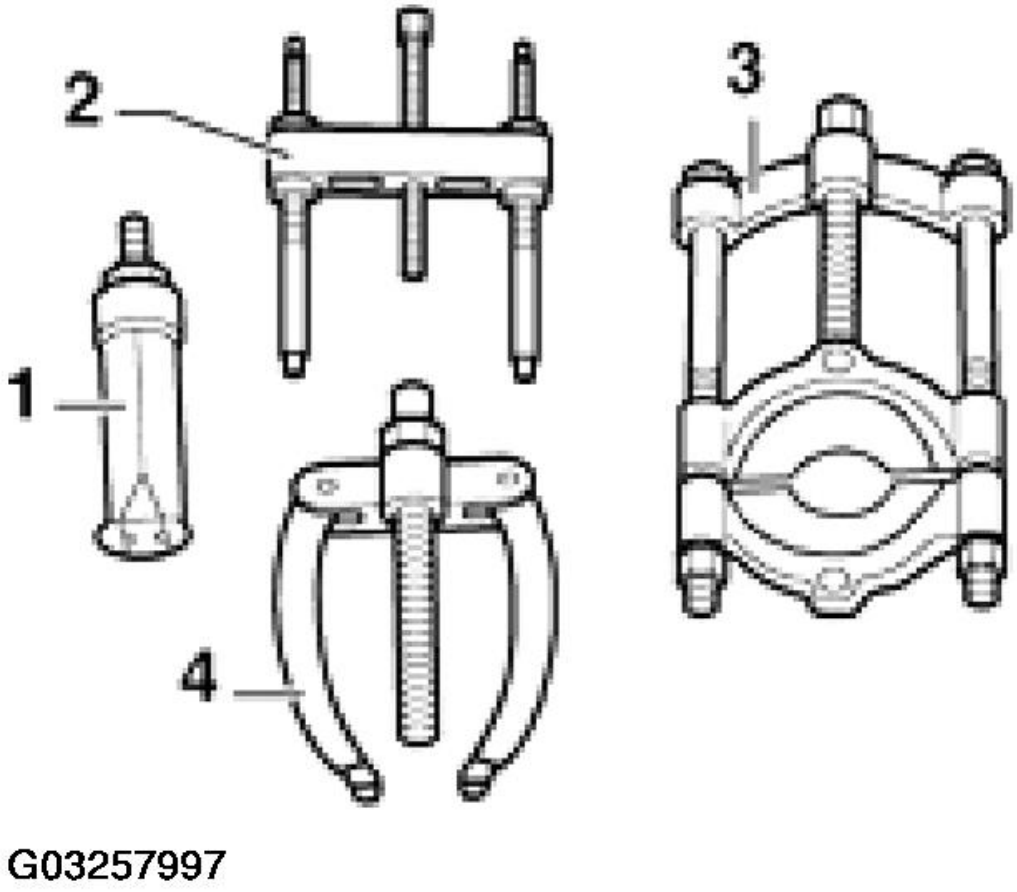


Fig. 28: Identifying 1 - Kukko 21/2 Internal Puller
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The following list refers to items in Fig. 29 .

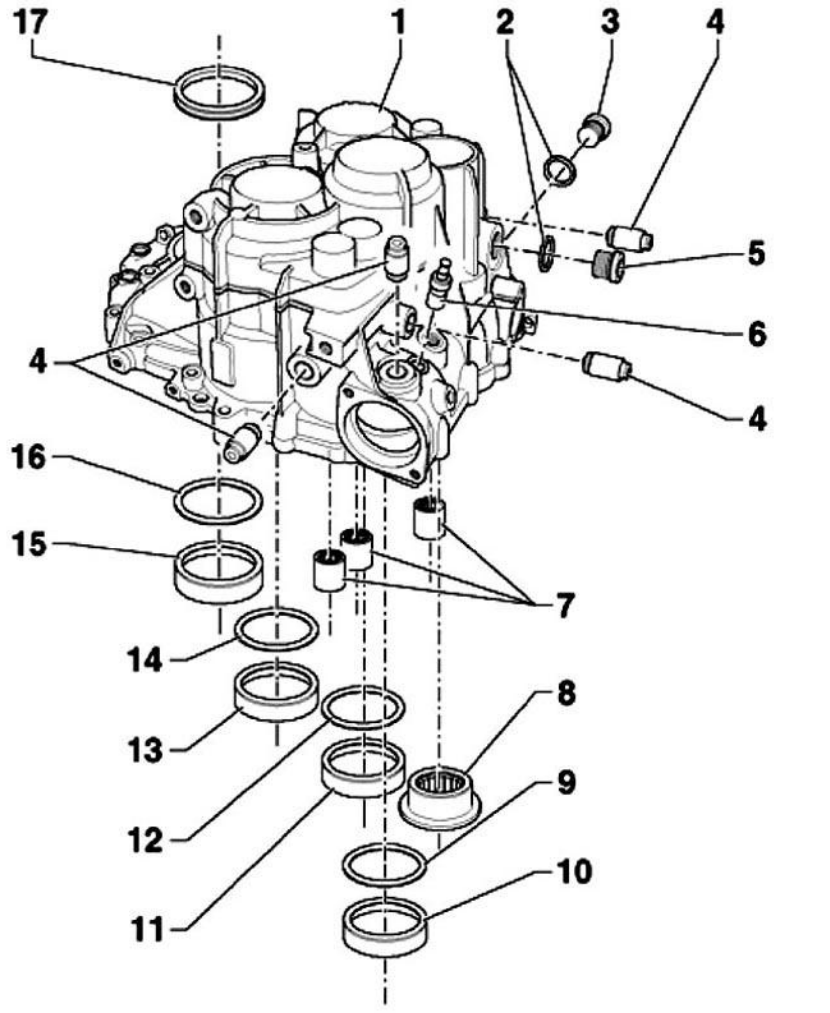
1. **Transmission housing**
   - Clamping in assembly bracket. See **Securing transmission housing to assembly bracket with bolts** .
   - If replaced: adjust input shaft, output shafts and differential. See **Adjustment overview** .
2. **Oil seal**
   - Always replace
3. **Oil drain plug, 30 N.m**
   - Always replace

4. **Stop sleeves**
   - Driving out. See **Driving out stop sleeve**
   - Driving in. See **Driving stop sleeve in onto stop**
5. **Oil filler plug, 30 N.m**
   - Always replace
6. **Locking pin**
   - Is pressed into gate of selector shaft when adjusting outer selector mechanism. See **SELECTOR MECHANISM** .
   - Driving out. See **Driving out locking pin**
   - Driving in. See **Driving in locking pin onto stop**
7. **Bushing**
   - For selector rods
   - Replace each time after removing
   - Pulling out. See **Pulling out mounting bushing for selector rod** .
   - Installing. See **Driving selector rod mounting bushing in flush** .
8. **Needle bearing**
   - Replace each time after removing
   - Pulling out **Pulling reverse shaft needle bearing out of transmission housing** .
   - Pressing in. See **Pressing needle bearing into transmission housing** .
9. **Shim**
   - For input shaft
   - Adjustment overview. See **Adjustment overview** .
10. **Outer race/tapered roller bearing**
    - For input shaft
    - Removing and installing. See from **Input shaft, disassembling and assembling** .
    - If replaced: Adjust input shaft. See **Input shaft, adjusting** .
11. **Outer race/tapered roller bearing**
    - For 5th, 6th and reverse gear output shaft
    - Removing and installing. See from **Output shaft for 5th, 6th and reverse gear, disassembling and assembling** .
    - If replaced: adjust 5th, 6th and reverse gear output shaft. See **Output shaft for 5th, 6th and reverse gear, adjusting** .
12. **Shim**
    - For 5th, 6th and reverse gear output shaft
    - Adjustment overview. See **Adjustment overview** .
13. **Outer race/tapered roller bearing**
    - For 1st-4th gear output shaft
    - Removing and installing. See **Pulling tapered roller bearing outer race out of transmission**

housing .

- If replaced: Adjust 1st-4th gear output shaft. See **Output shaft for 1st-4th gears, adjusting** .

14. **Shim**
    - For 1st-4th gear output shaft
    - Adjustment overview. See **Adjustment overview** .
15. **Outer race/tapered roller bearing**
    - For differential
    - Removing and installing. See from **Differential, disassembling and assembling** .
    - If replaced: adjust differential. See **Differential, adjusting** .
16. **Shim**
    - For differential
    - Adjustment overview. See **Adjustment overview** .
17. **Oil seal**
    - Replace. See **OIL SEALS FOR FLANGED SHAFTS, REPLACING** .



1 - Transmission housing
2 - Oil seal
3 - Oil drain plug, 30 Nm
4 - Stop sleeves
5 - Oil filler plug, 30 Nm
6 - Locking pin
7 - Bushing
8 - Needle bearing
9 - Shim
10 - Outer race/tapered roller bearing
11 - Outer race/tapered roller bearing
12 - Shim
13 - Outer race/tapered roller bearing
14 - Shim
15 - Outer race/tapered roller bearing
16 - Shim
17 - Oil seal

G03257998

Fig. 29: Identifying Components Of Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Securing transmission housing to assembly bracket with bolts

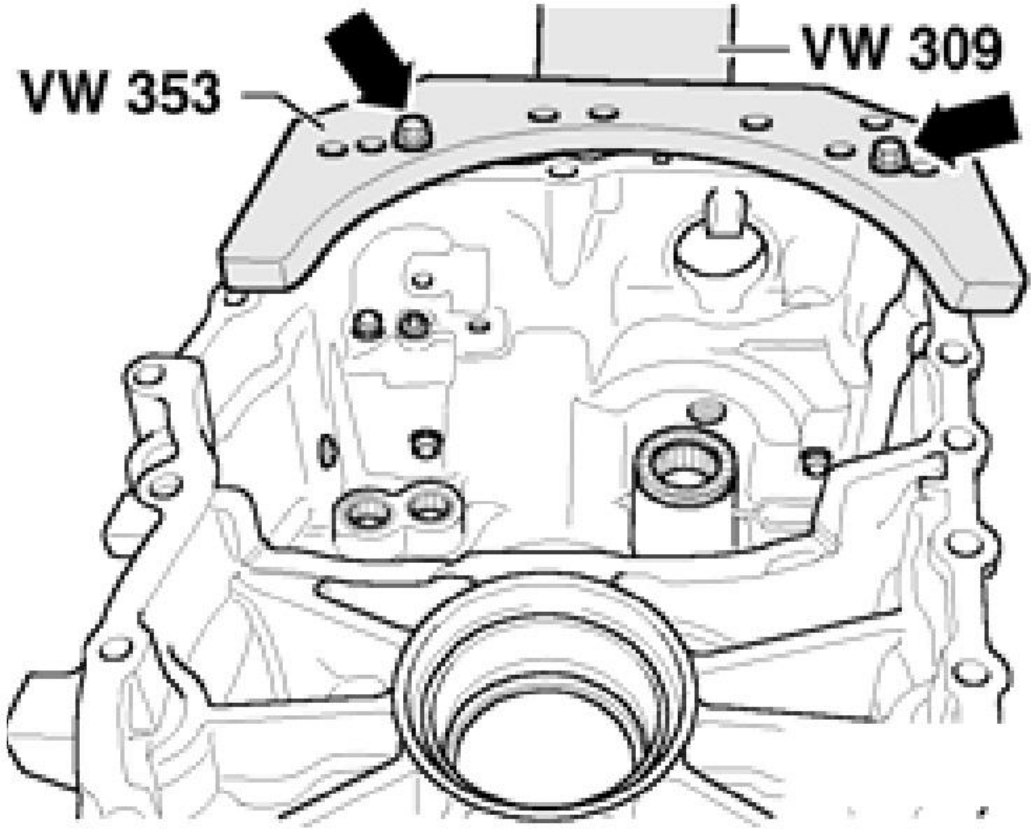


Fig. 30: Securing Transmission Housing To Assembly Bracket With Bolts
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Driving out stop sleeve

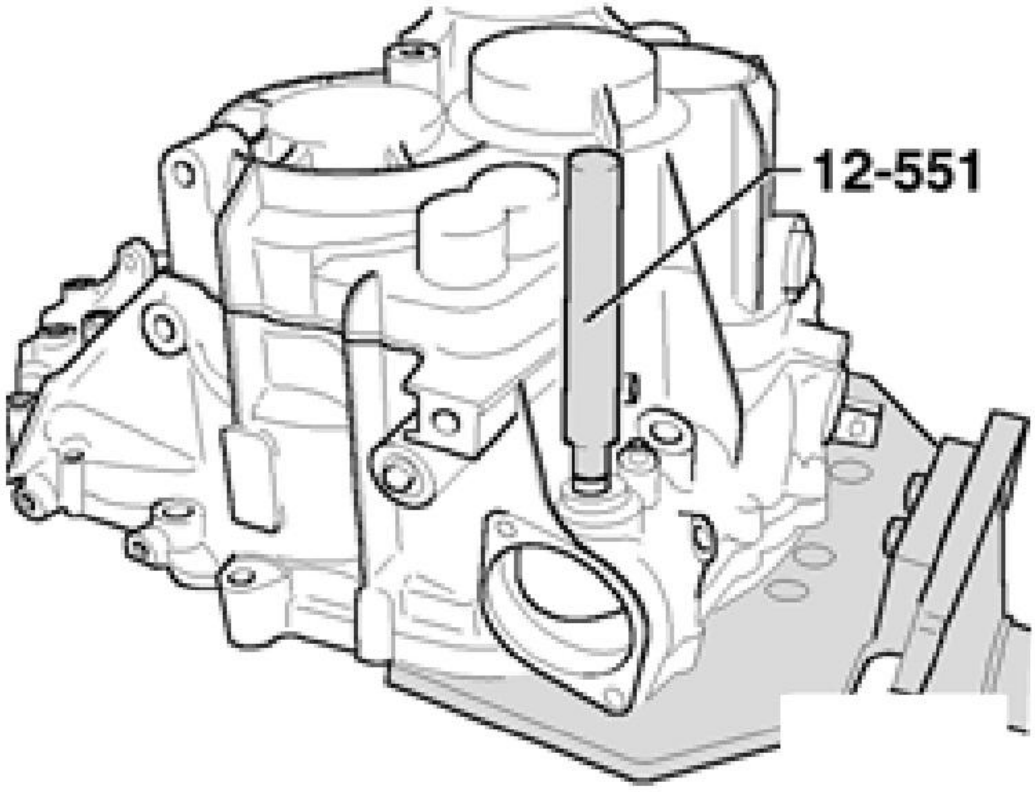


Fig. 31: Driving Out Stop Sleeve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Driving stop sleeve in onto stop

- Drive stop sleeve in onto stop with 13 mm socket -A- and plastic head hammer.

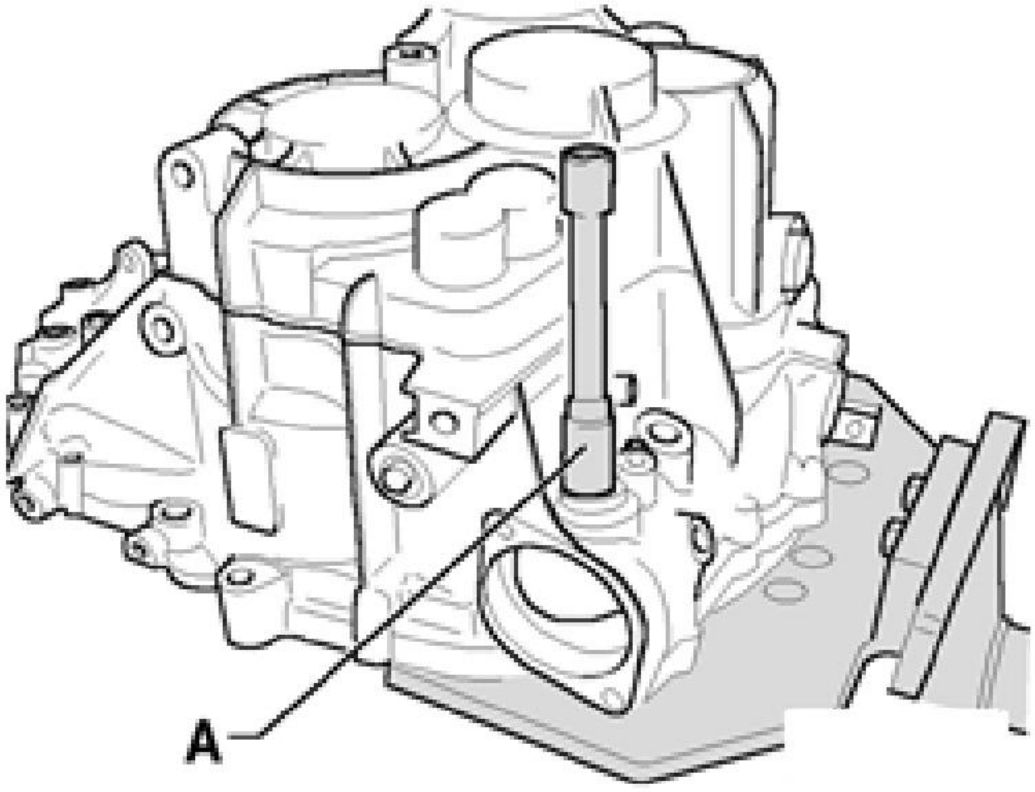


Fig. 32: Driving Stop Sleeve In Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Driving out locking pin

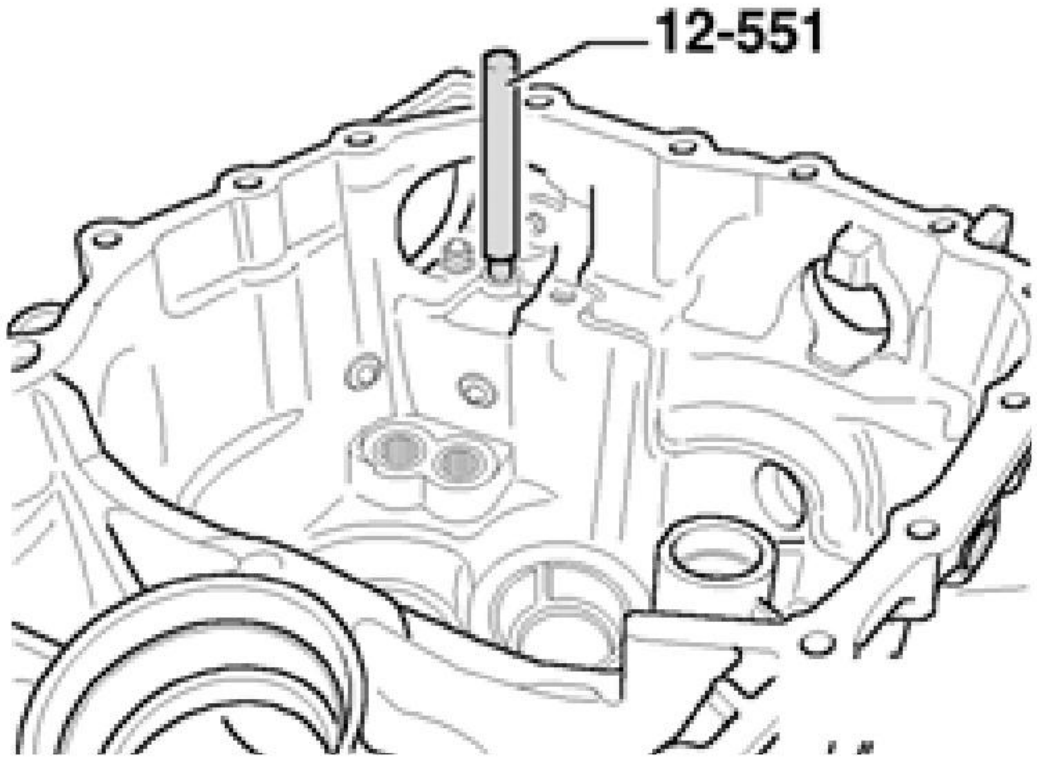


Fig. 33: Driving Out Locking Pin
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Driving in locking pin onto stop

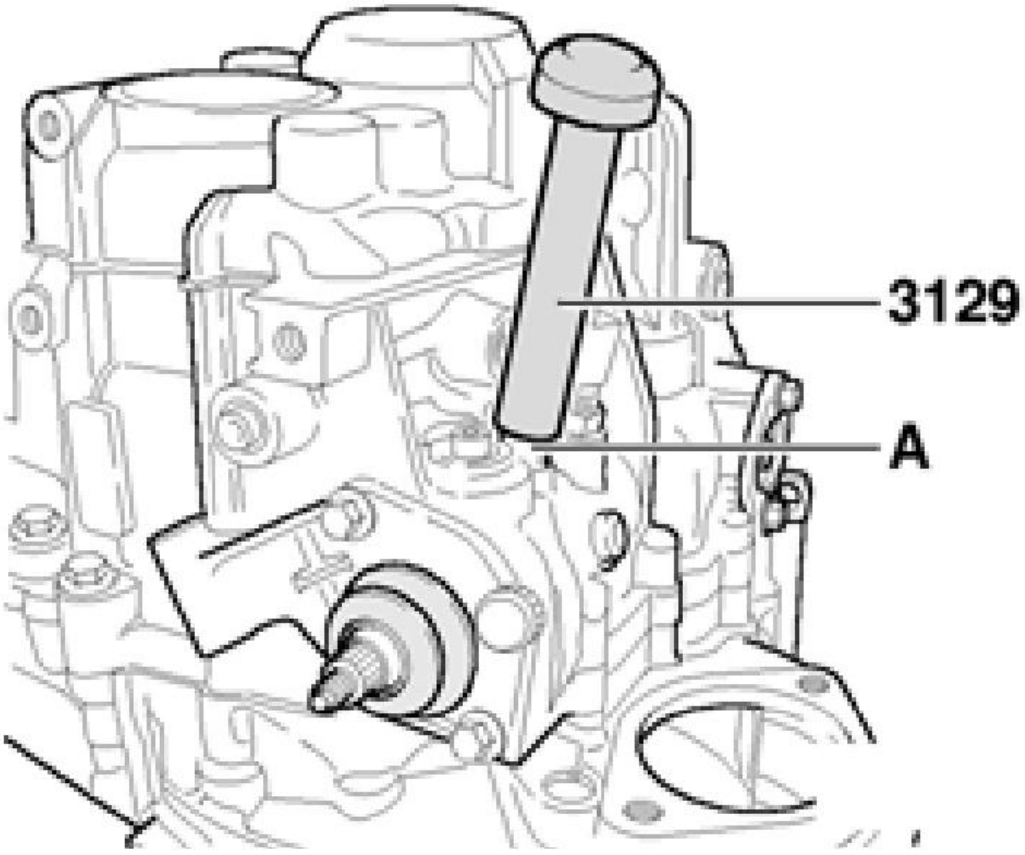


Fig. 34: Driving In Locking Pin -A- Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling out mounting bushing for selector rod

A. Internal extractor 14.5 to 18.5 mm, e.g. Kukko 21/2

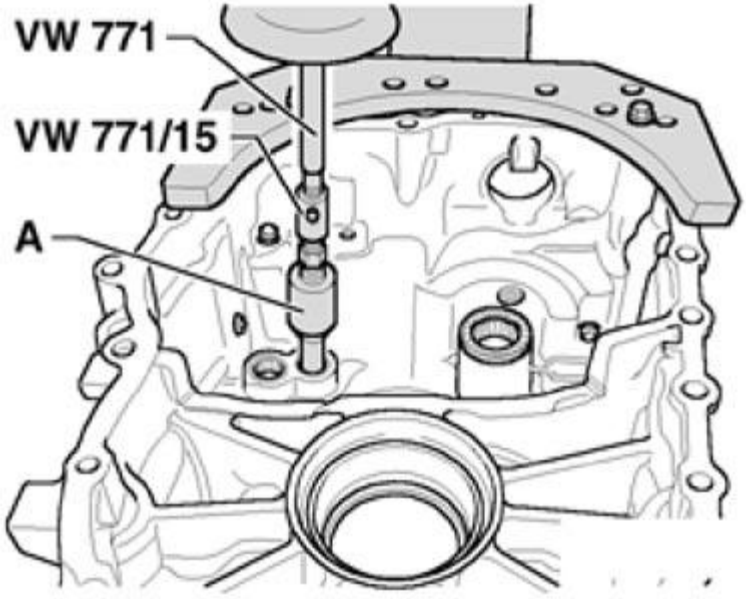


Fig. 35: Pulling Out Mounting Bushing For Selector Rod
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Driving selector rod mounting bushing in flush

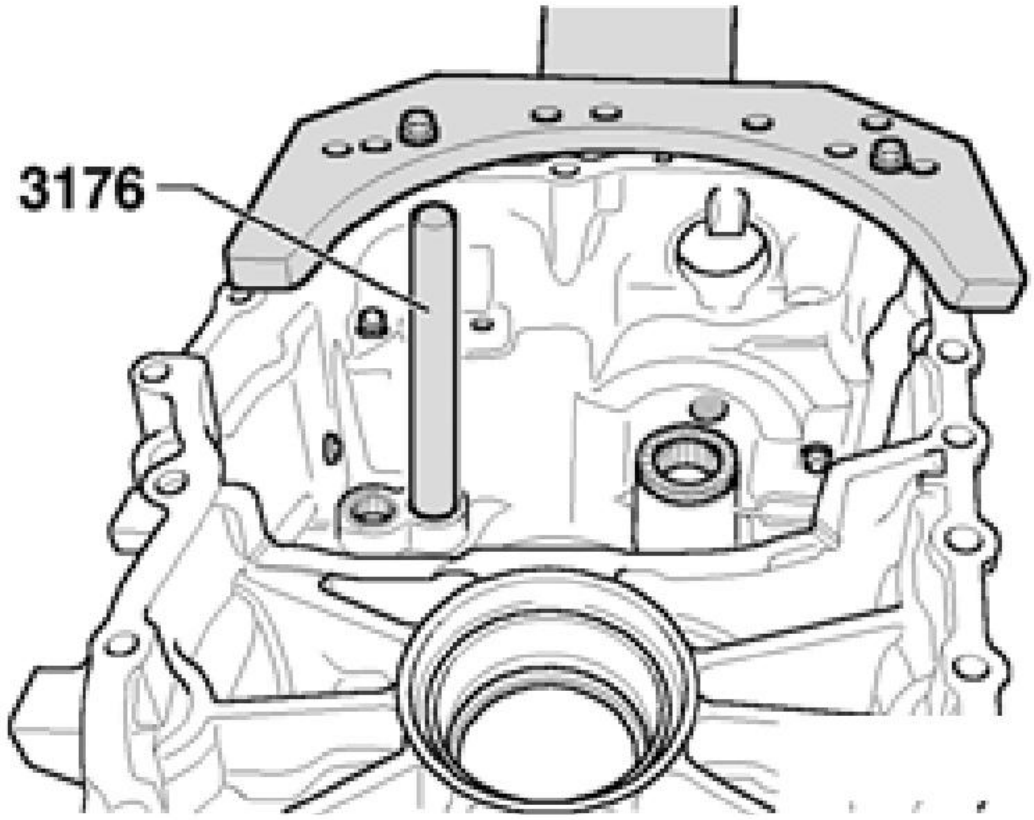


Fig. 36: Driving Selector Rod Mounting Bushing In Flush
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling reverse shaft needle bearing out of transmission housing

A. Internal extractor 23.5 to 30.0 mm, e.g. Kukko 21/4

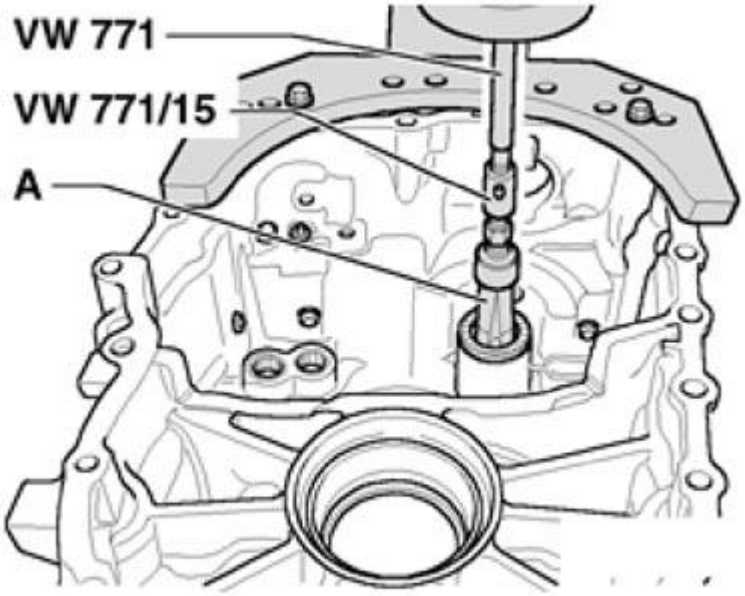


Fig. 37: Pulling Reverse Shaft Needle Bearing Out Of Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The needle bearing is destroyed during removal and must be replaced.

Pressing needle bearing into transmission housing

- Before pressing in, lay reverse shaft thrust washer -B- on needle bearing.

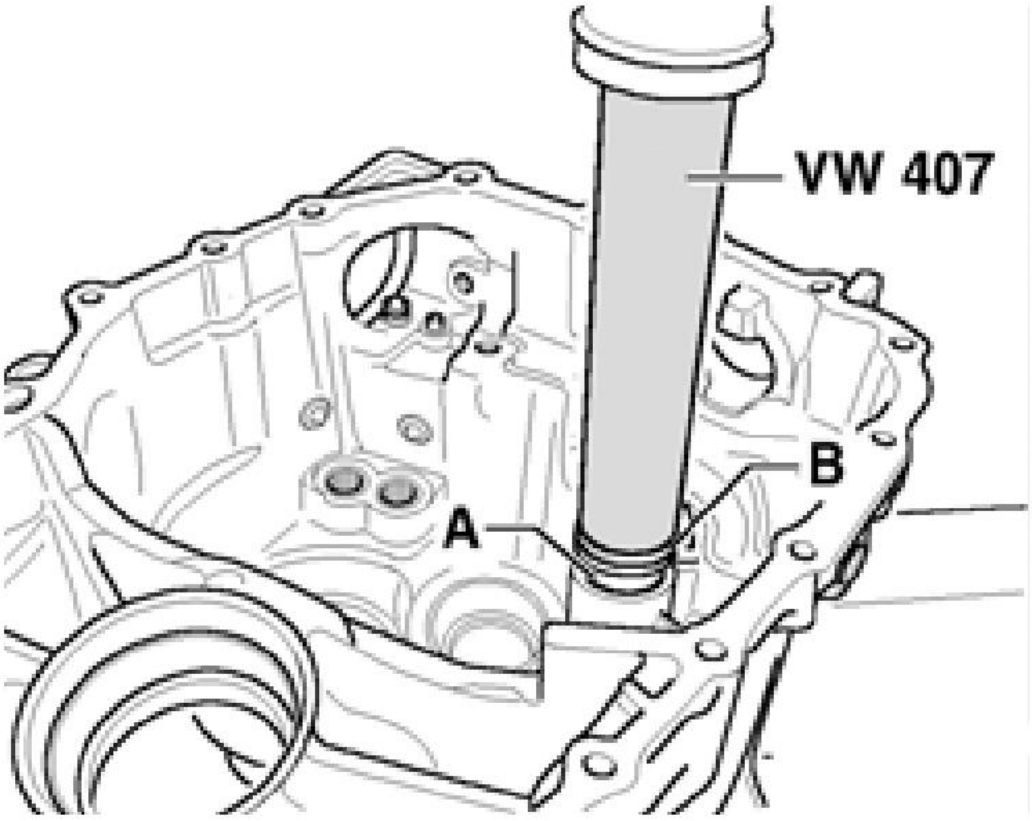


Fig. 38: Pressing Needle Bearing -A- Into Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

CLUTCH HOUSING, SERVICING

Special tools and equipment

- VW 407 Press tool
- 30-21 Sleeve
- 3176 Centering mandrel
- T40008 Press piece
- 1 - Kukko 21/2 Internal puller
- 1 - Kukko 21/4 Internal puller
- 4 - Kukko 22/1 Counter support
- 4 - Kukko 22/2 Counter support

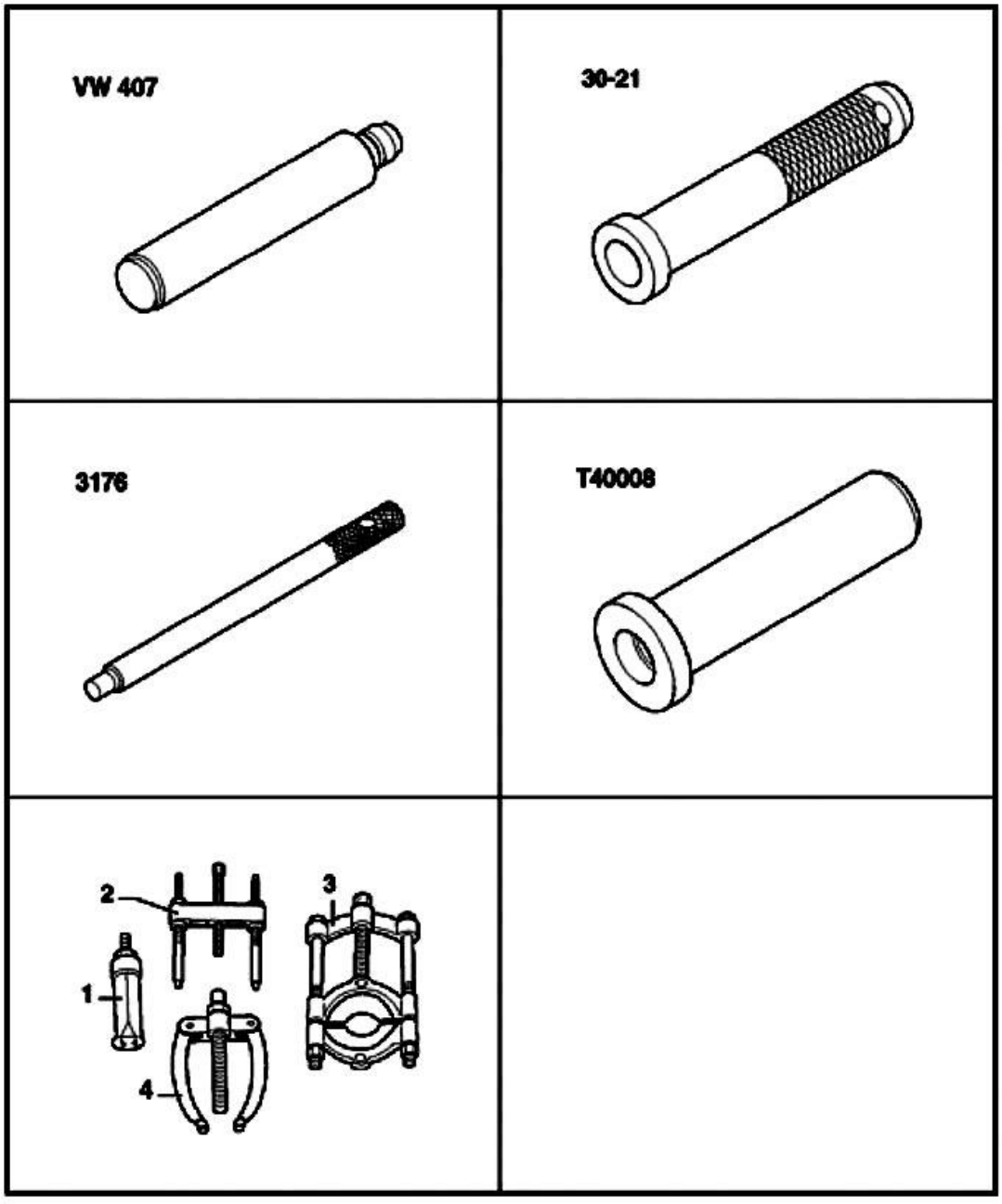


Fig. 39: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The following list refers to items in Fig. 40 .

1. **Bushing**

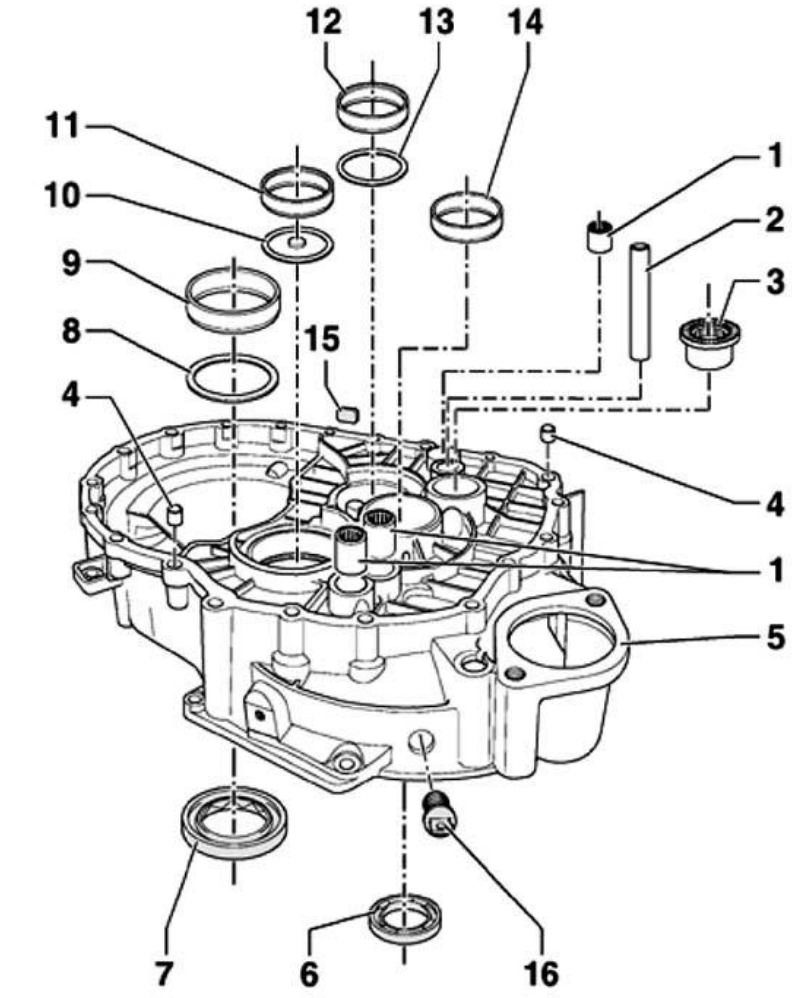
- For selector rods
- Replace each time after removing
- Pulling out. See **Pulling Out Selector Rod Bushing**
- Driving in. See **Driving Selector Rod Mounting Bushing In Flush**

2. **Reverse gear selector fork axle**
   - Axle cannot be removed with workshop tools
   - Pressing axle into clutch housing. See **Pressing Reverse Gear Selector Fork Shaft Into Clutch Housing** .
3. **Needle bearing**
   - Replace each time after removing
   - Pulling out. See **Pulling Needle Bearing Out Of Clutch Housing** .
   - Pressing in. See **Pressing Needle Bearing -A- Into Clutch Housing** .
4. **Dowel sleeve**
   - Qty. 2
5. **Clutch housing**
   - If replaced: See Adjustment overview. See **Adjustment overview** .
6. **Input shaft oil seal**
   - Removing. See **Removing Input Shaft Oil Seal** .
   - Installing. See **Driving In Input Shaft Oil Seal Flush** .
7. **Oil seal**
   - Replace. See **OIL SEALS FOR FLANGED SHAFTS, REPLACING** .
8. **Shim**
   - For differential
   - Always 0.65 mm thick
9. **Outer race/tapered roller bearing**
   - For differential
   - Removing and installing. See from **Differential, disassembling and assembling** .
   - If replaced: adjust differential. See **Differential, adjusting** .
10. **Oil deflector ring**
    - Installation position: shoulder on drilling faces output shaft
11. **Outer race/tapered roller bearing**
    - For 1st-4th gear output shaft
    - Removing and installing. See **Pulling tapered roller bearing outer race out of transmission housing**
    - If replaced: adjust 1st-4th gear output shaft. See **Output shaft for 1st-4th gears, adjusting** .
12. **Outer race/tapered roller bearing**
    - For 5th, 6th and reverse gear output shaft
    - Removing and installing. See **Output shaft for 5th, 6th and reverse gear, disassembling and**

assembling .

- If replaced: adjust 5th, 6th and reverse gear output shaft. See **Output shaft for 5th, 6th and reverse gear, adjusting** .

13. **Shim**
    - For output shaft
    - Always 0.65 mm thick
14. **Outer race/tapered roller bearing**
    - For input shaft
    - Removing and installing. See **Input shaft, disassembling and assembling** .
    - If replaced: adjust input shaft. See **Input shaft, adjusting** .
15. **Magnet**
    - Held in place by housing joint surface
16. **Protective cap**



1 - Bushing
2 - Reverse gear selector fork axle
3 - Needle bearing
4 - Dowel sleeve
5 - Clutch housing
6 - Input shaft oil seal
7 - Oil seal
8 - Shim
9 - Outer race/tapered roller bearing
10 - Oil deflector ring
11 - Outer race/tapered roller bearing
12 - Outer race/tapered roller bearing
13 - Shim
14 - Outer race/tapered roller bearing
15 - Magnet
16 - Protective cap

G03258009

Fig. 40: Identifying Clutch Housing Components
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling Out Selector Rod Bushing

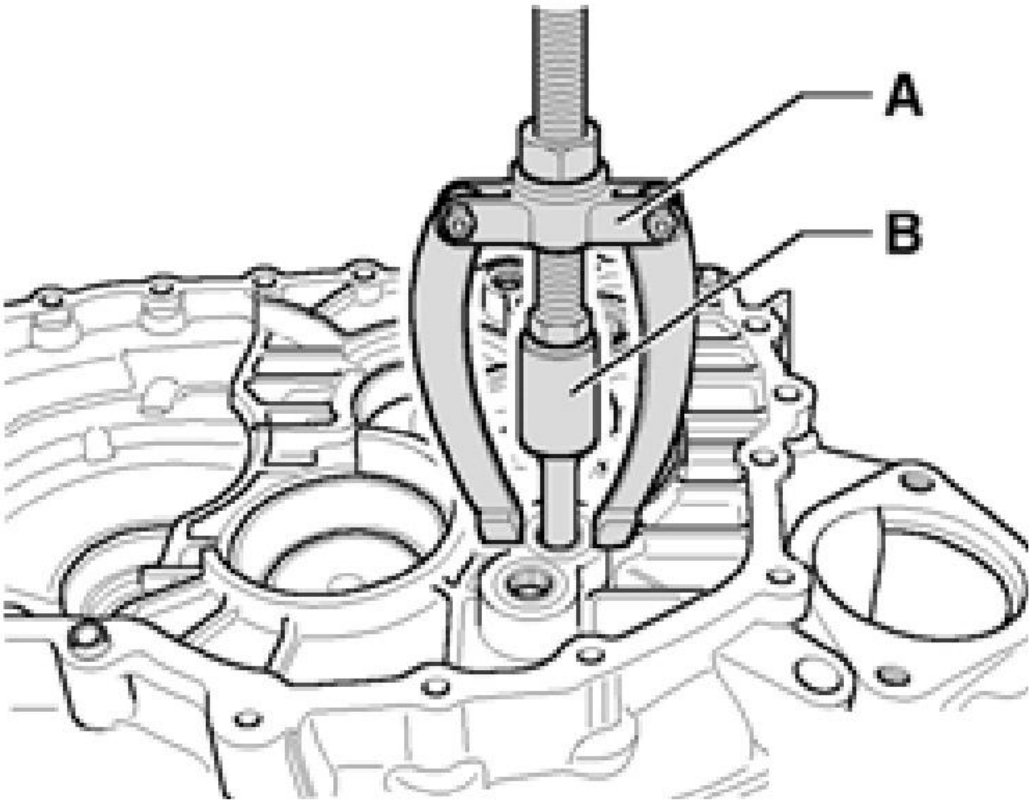


Fig. 41: Pulling Out Selector Rod Bushing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Counter support, e.g. Kukko 22/1
B. Internal extractor 14.5 to 18.5 mm, e.g. Kukko 21/2

Driving Selector Rod Mounting Bushing In Flush

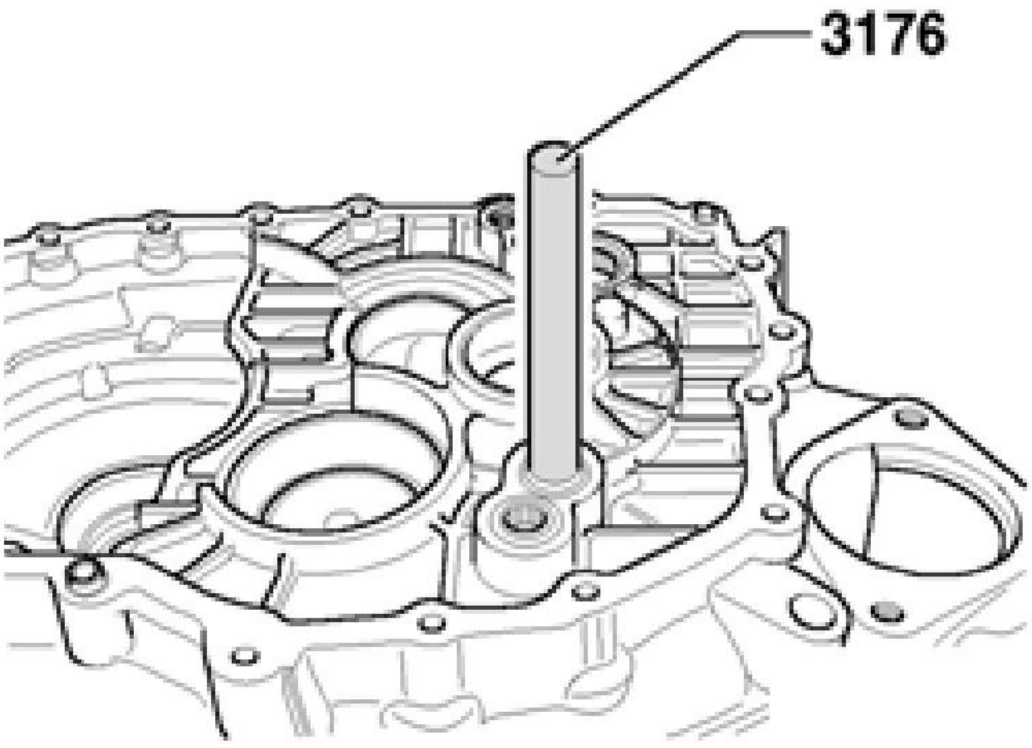


Fig. 42: Driving Selector Rod Mounting Bushing In Flush
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling Needle Bearing Out Of Clutch Housing

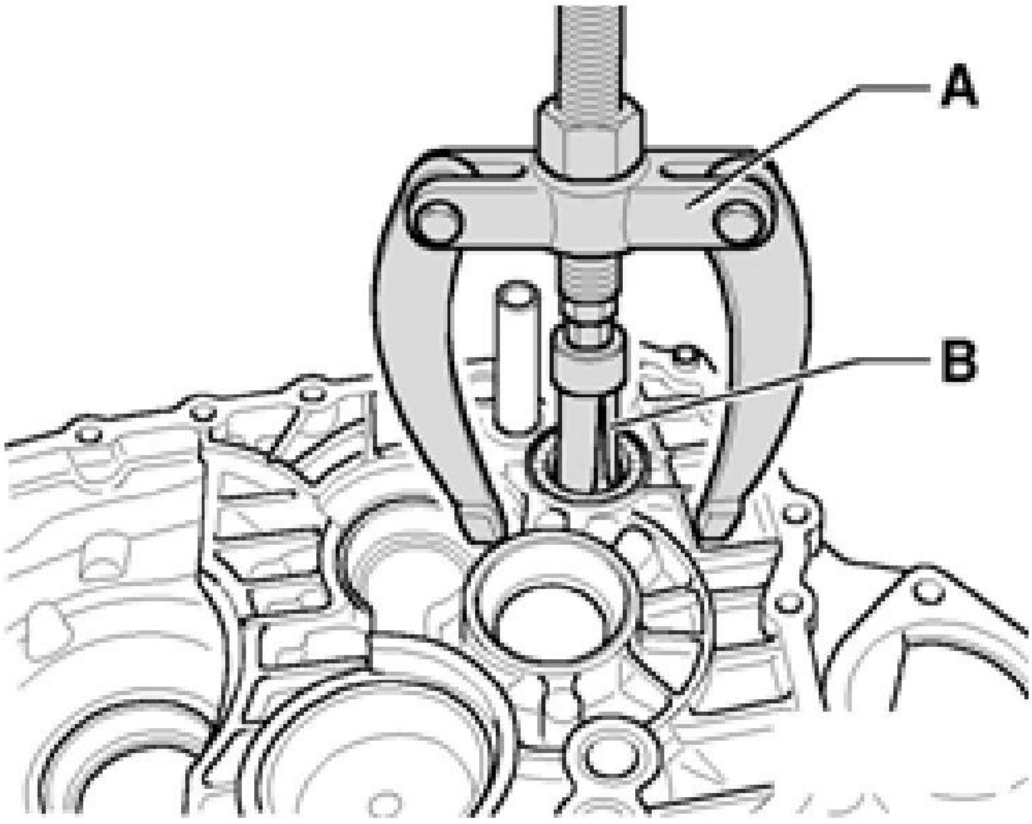


Fig. 43: Pulling Needle Bearing Out Of Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Counter support, e.g. Kukko 22/2
B. Internal extractor 23.5 to 30 mm, e.g. Kukko 21/4

NOTE: The needle bearing is destroyed during removal and must be replaced.

Pressing Needle Bearing -A- Into Clutch Housing

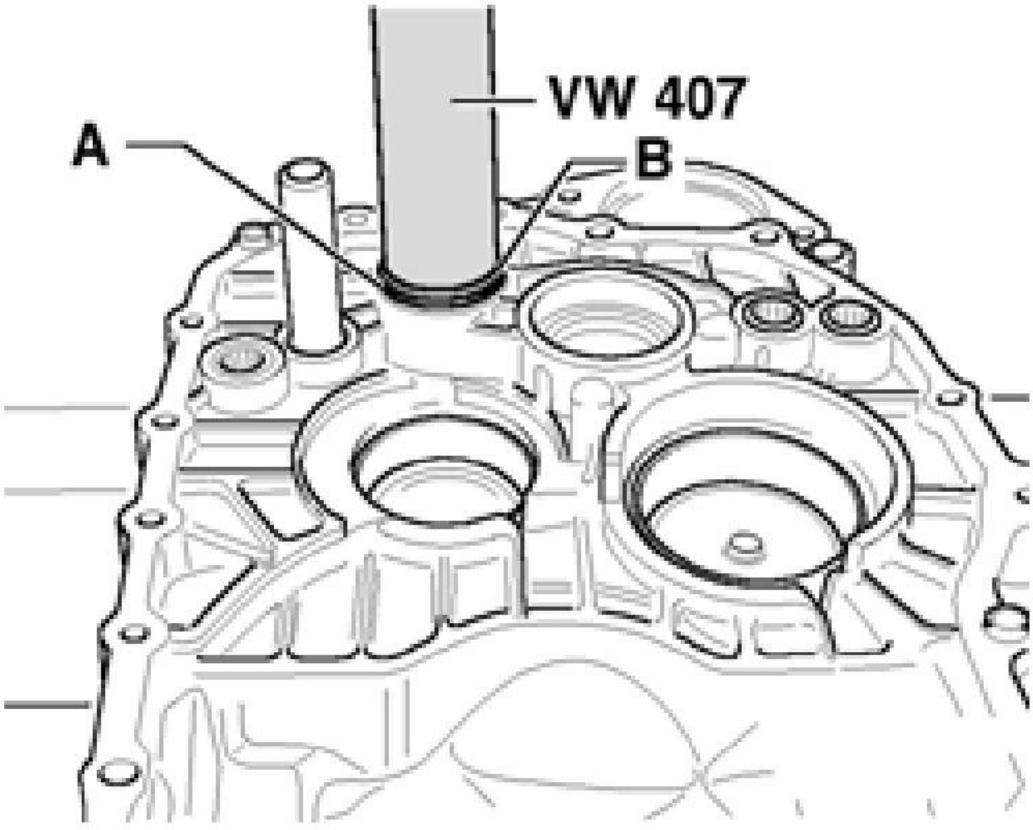


Fig. 44: Pressing Needle Bearing -A- Into Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Before pressing in, lay reverse shaft thrust washer -B- on needle bearing.

Removing Input Shaft Oil Seal

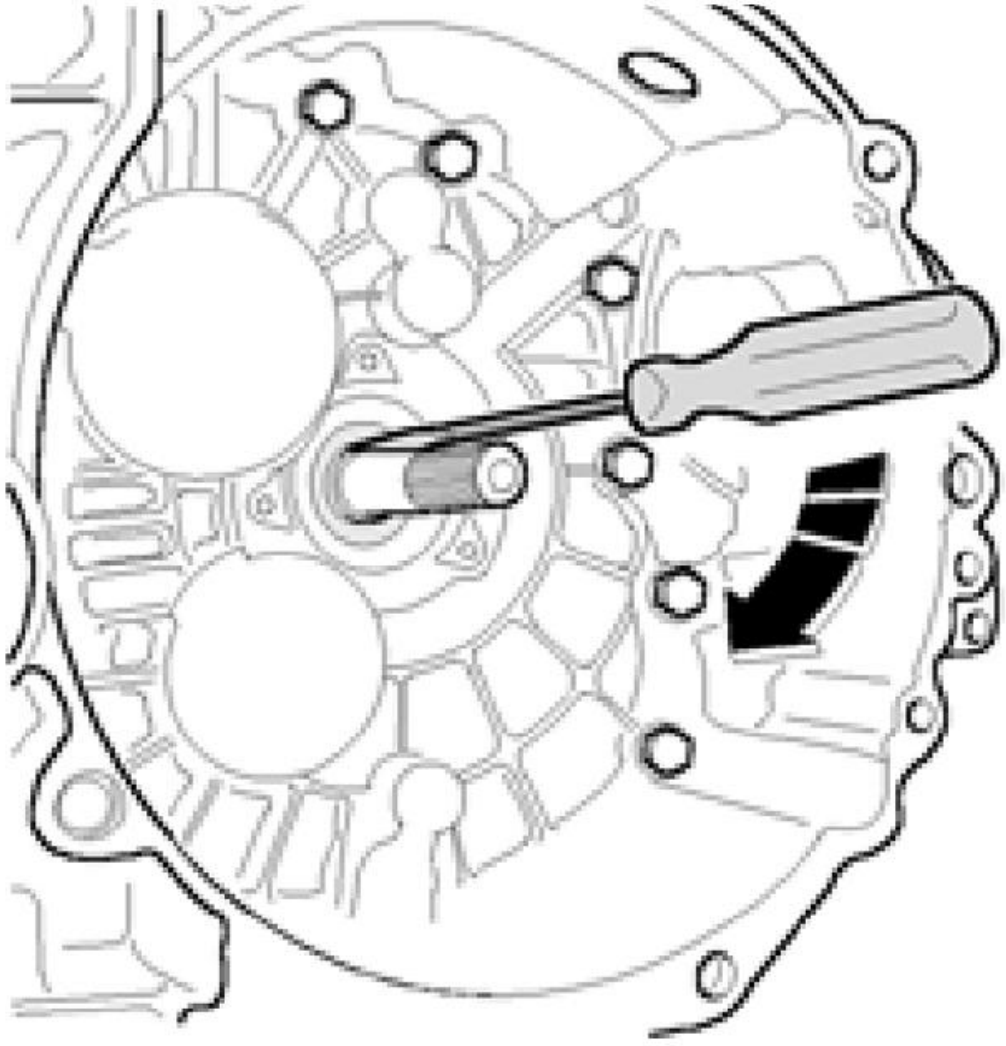


Fig. 45: Removing Input Shaft Oil Seal
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Lever oil seal out carefully with a screwdriver.

When transmission is disassembled, oil seal can be removed with sleeve 30-21.

Driving In Input Shaft Oil Seal Flush

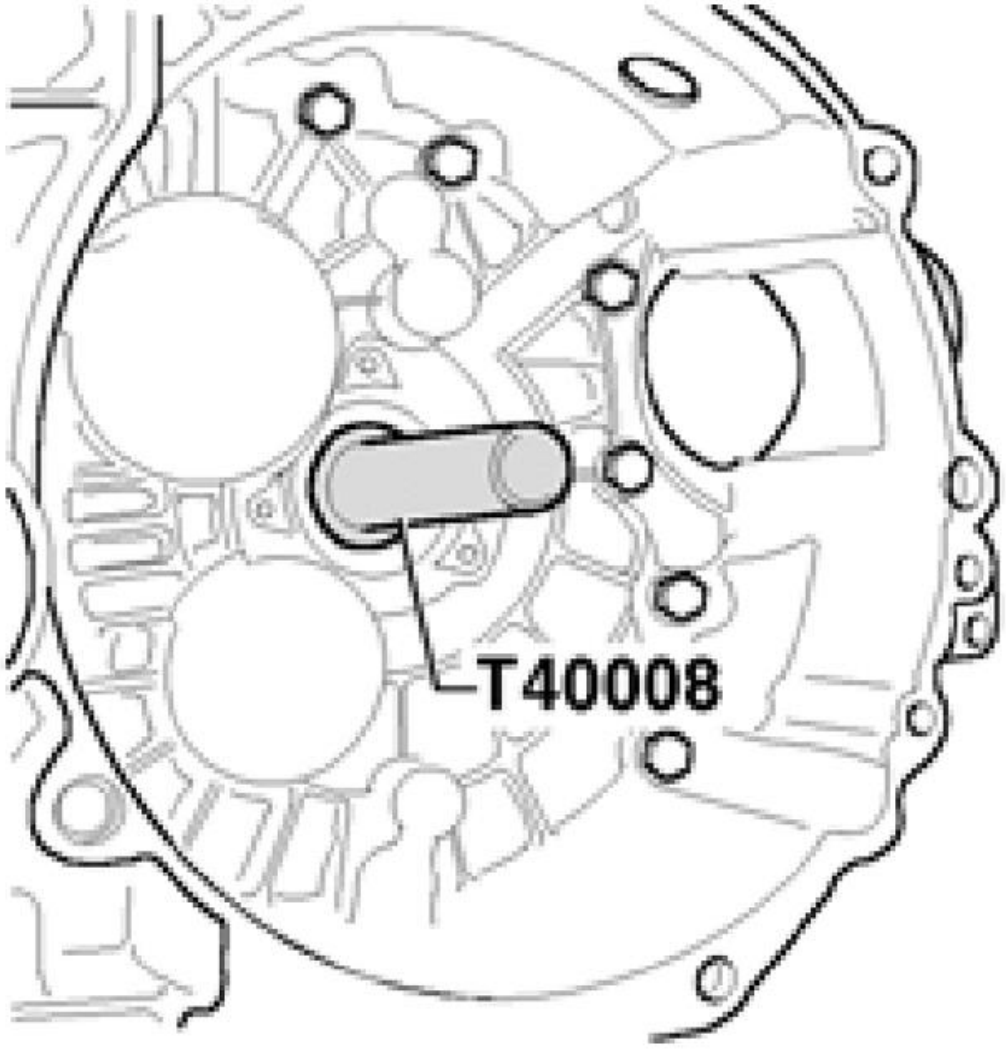


Fig. 46: Driving In Input Shaft Oil Seal Flush
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing Reverse Gear Selector Fork Shaft Into Clutch Housing

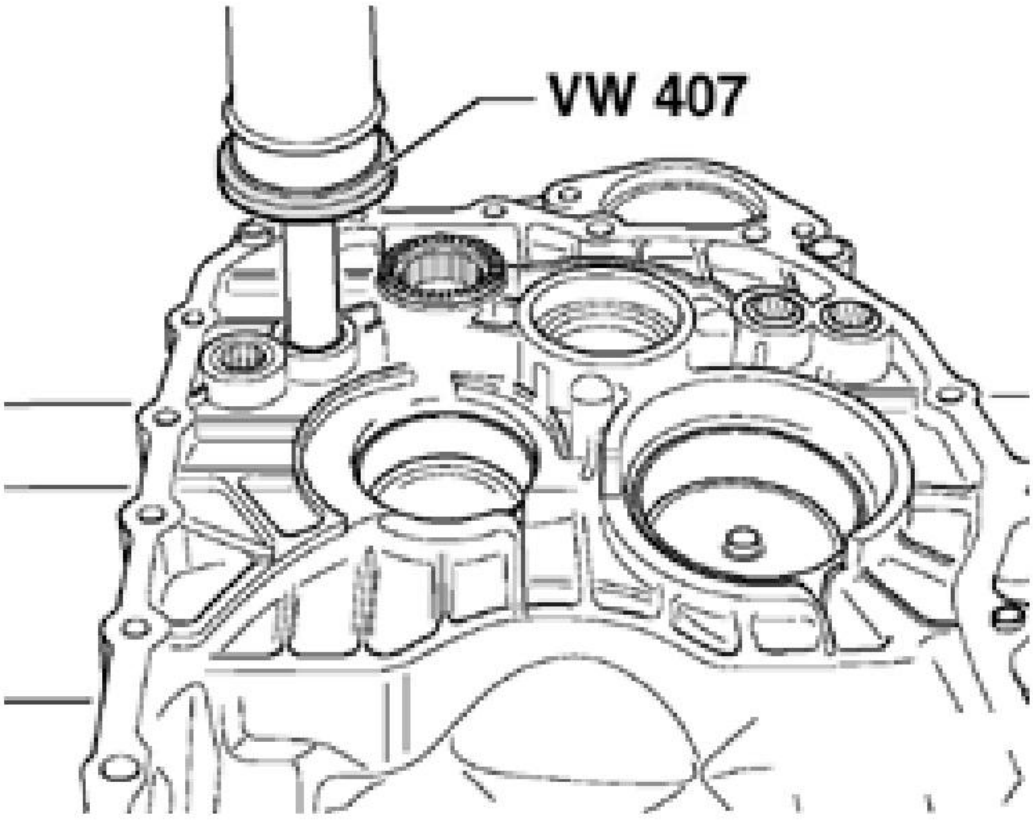


Fig. 47: Pressing Reverse Gear Selector Fork Shaft Into Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

TRANSMISSION SELECTOR MECHANISM, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 402 Thrust plate
- VW 412 Press tool
- VW 421 Tube
- VW 423 Tube
- 3118 Tube

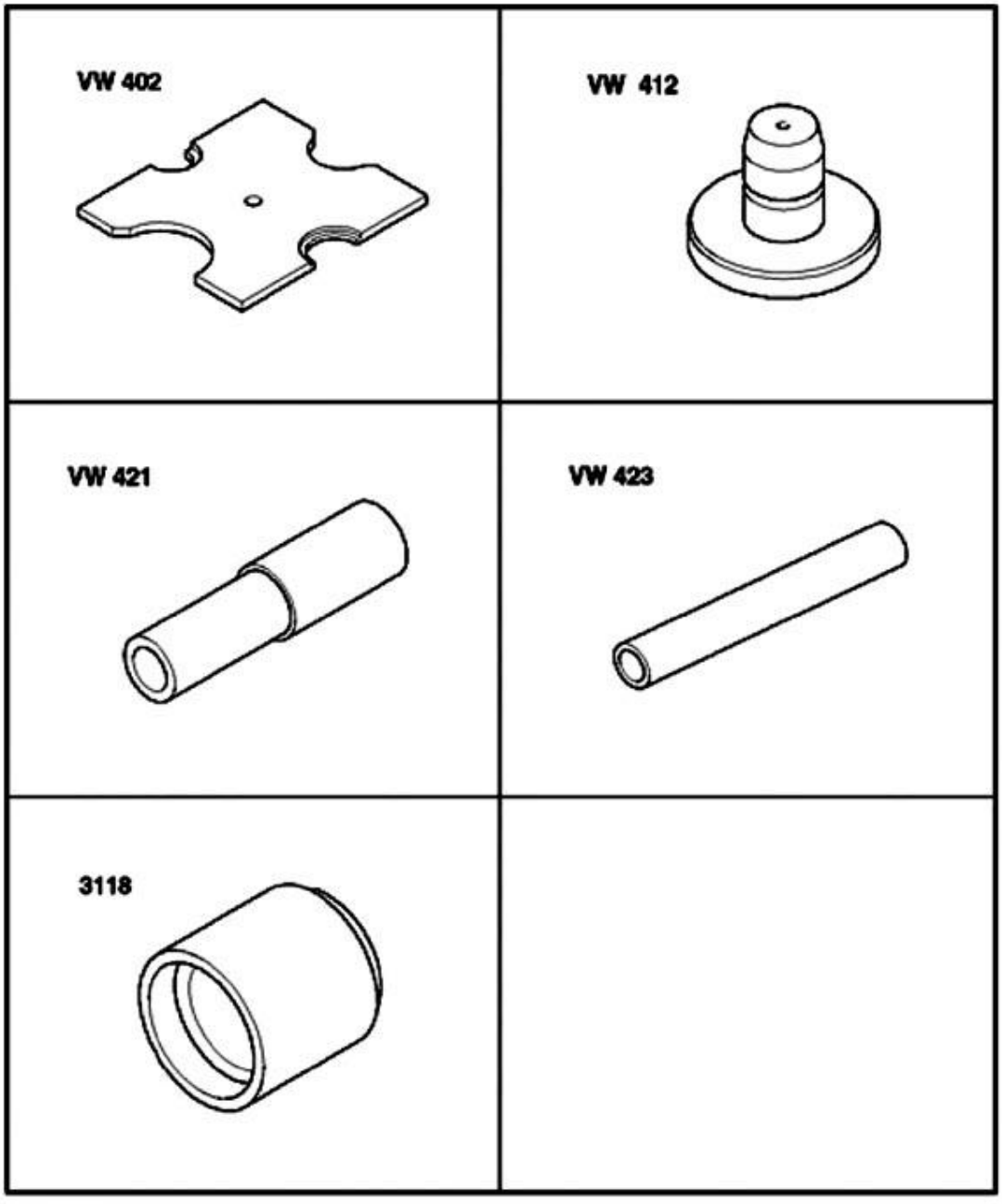


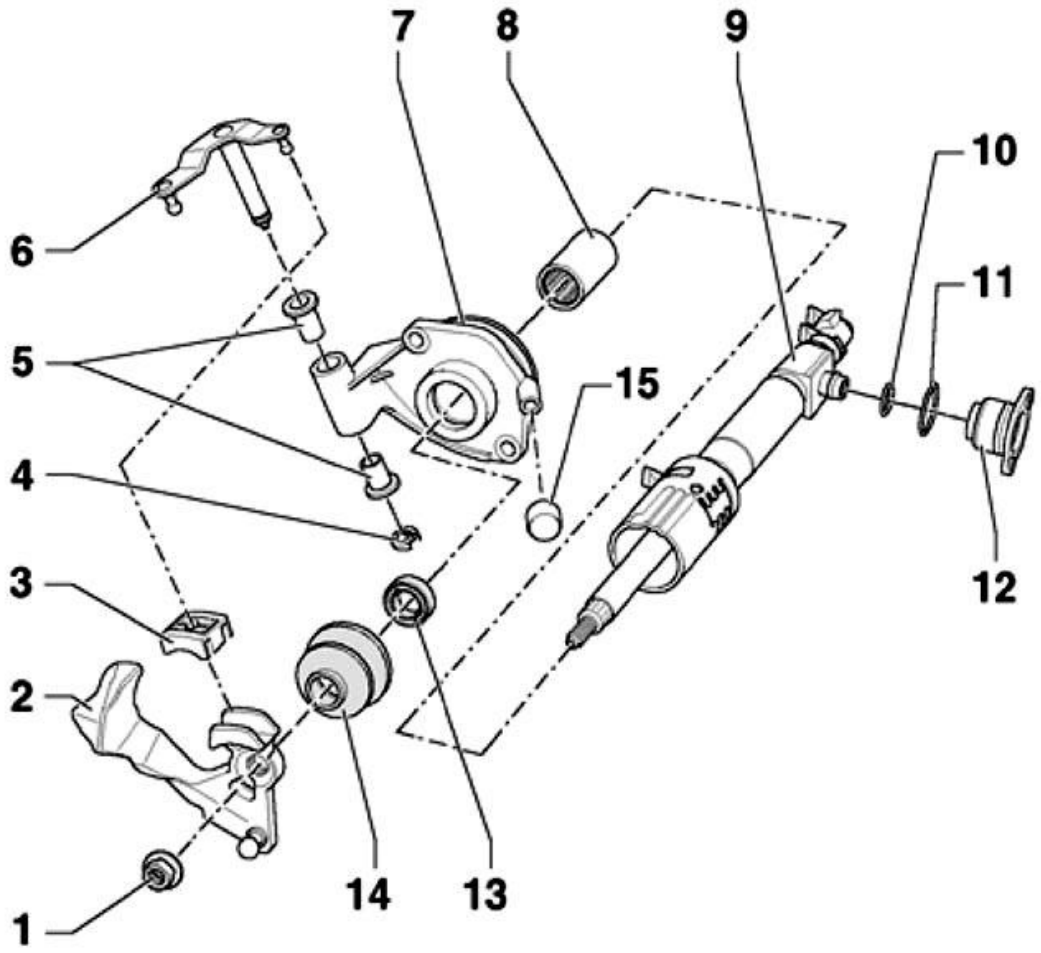
Fig. 48: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The following list refers to items in Fig. 49 .

1. **Hex nut, 20 N.m**

- Self-locking
- Always replace

2. **Gear selector lever**
   - Install so that master spline aligns with selector shaft
   - Can be replaced with selector mechanism installed
   - Installation position. See **GEAR SHIFT LEVER & HOUSING** .
3. **Shoe**
   - Clip into relay lever -item 6-
4. **Lock washer**
   - Removing. See **Removing Relay Lever Lock Washer** .
5. **Bushing**
6. **Relay lever**
   - Installation position. See **GEAR SHIFT LEVER & HOUSING** .
7. **Selector mechanism cover**
8. **Ball sleeve**
   - For selector shaft
   - Removing. See **Pressing Ball Sleeve From Selector Mechanism Cover** .
   - Pressing in. See **Pressing Ball Sleeve Into Selector Mechanism Cover** .
9. **Selector shaft**
10. **O-ring**
    - Always replace
11. **O-ring**
    - Always replace
12. **End cover**
13. **Oil seal**
    - Pry out with screwdriver
    - Installing. See **Installing Oil Seal Onto Stop** .
14. **Protective cap**
    - For selector shaft
15. **Cap**
    - For transmission breather



1 - Hex nut, 20 Nm
2 - Gear selector lever
3 - Shoe
4 - Lock washer
5 - Bushing
6 - Relay lever
7 - Selector mechanism cover
8 - Ball sleeve
9 - Selector shaft
10 - O-ring
11 - O-ring
12 - End cover
13 - Oil seal
14 - Protective cap
15 - Cap

G03258018

Fig. 49: Disassembling And Assembling Transmission Selector Mechanism
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing Relay Lever Lock Washer

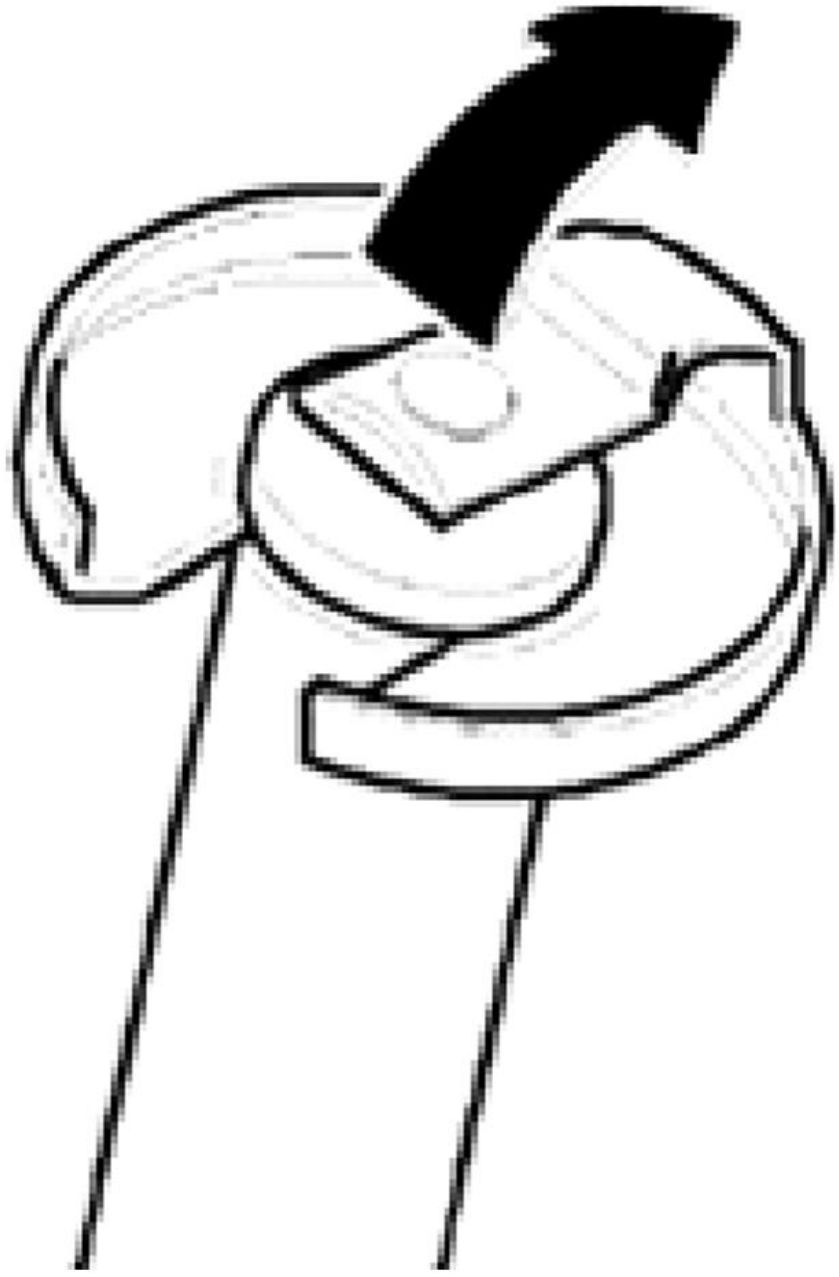


Fig. 50: Removing Relay Lever Lock Washer
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Lift tab in direction of arrow.

Pressing Ball Sleeve From Selector Mechanism Cover

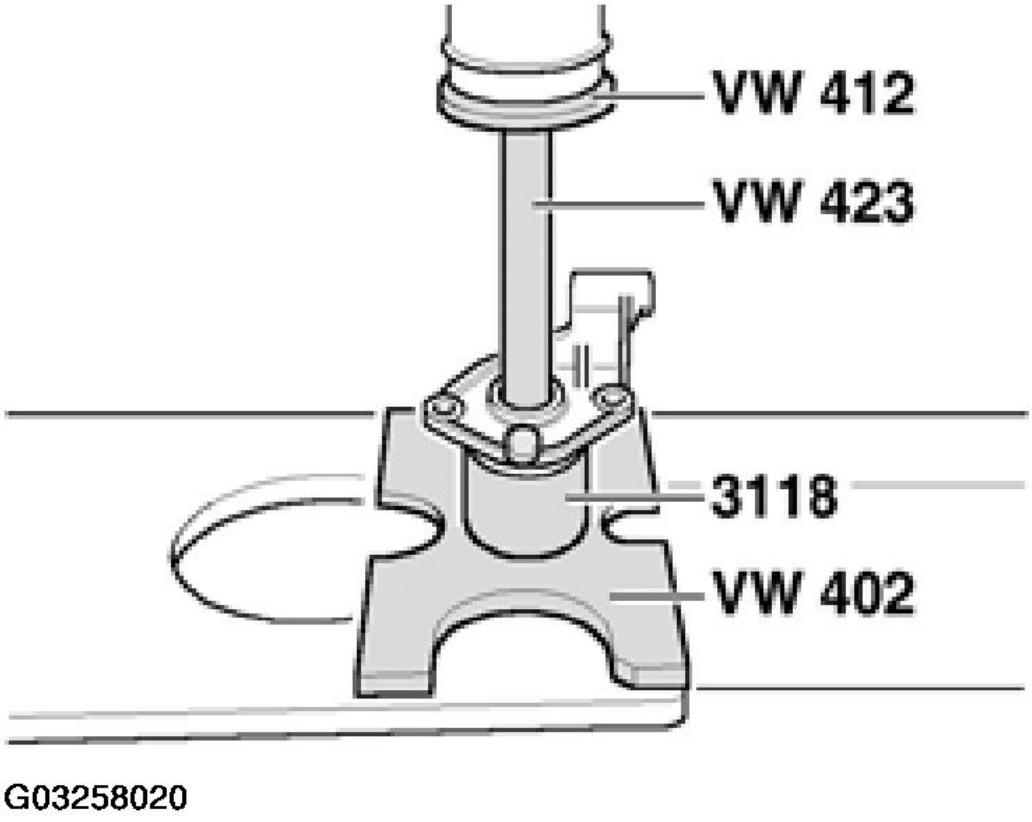


Fig. 51: Pressing Ball Sleeve From Selector Mechanism Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing Ball Sleeve Into Selector Mechanism Cover

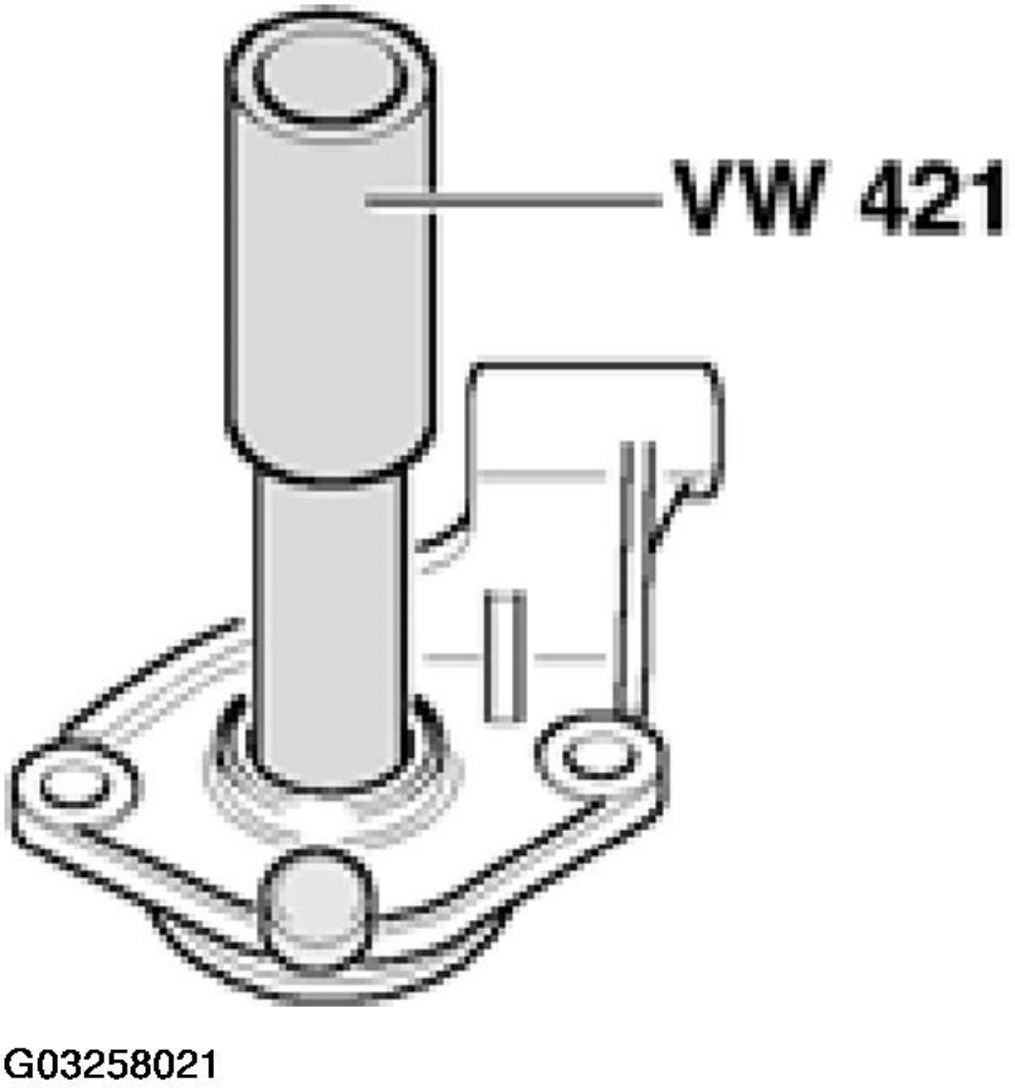


Fig. 52: Pressing Ball Sleeve Into Selector Mechanism Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press ball sleeve to contact with press plate VW 402.

Installing Oil Seal Onto Stop

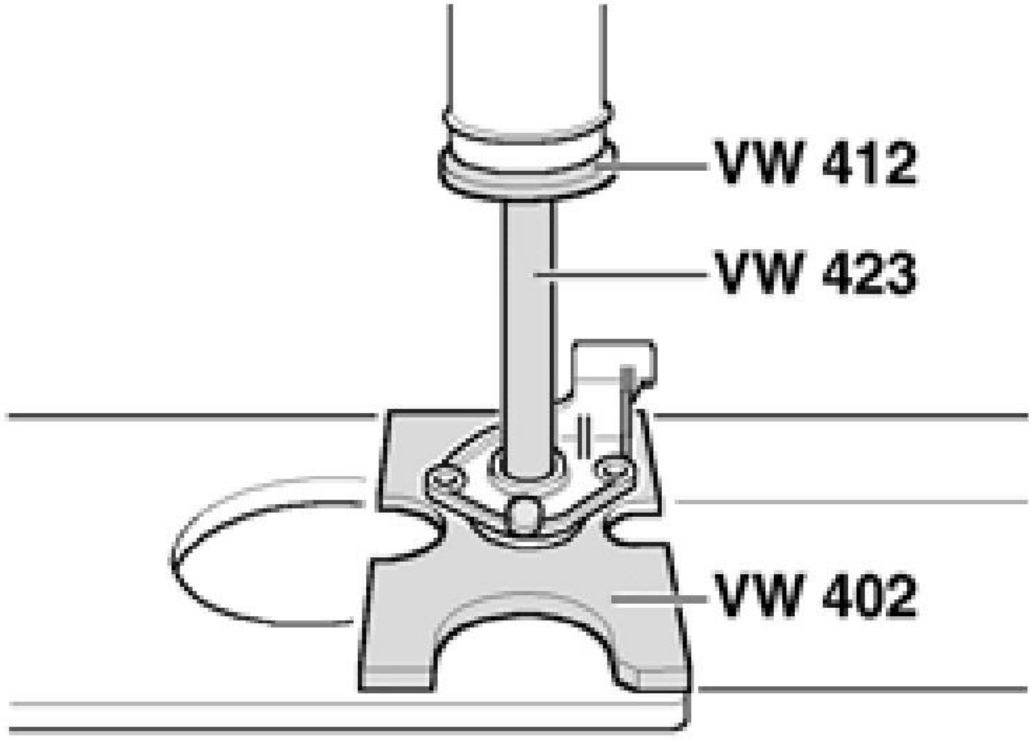


Fig. 53: Installing Oil Seal Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

SELECTOR FORKS, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 402 Thrust plate
- VW 411 Press tool
- VW 426 Tube
- VW 431 Press piece
- 1 - Kukko 21/3 Internal puller
- 4 - Kukko 22/1 Counter-support

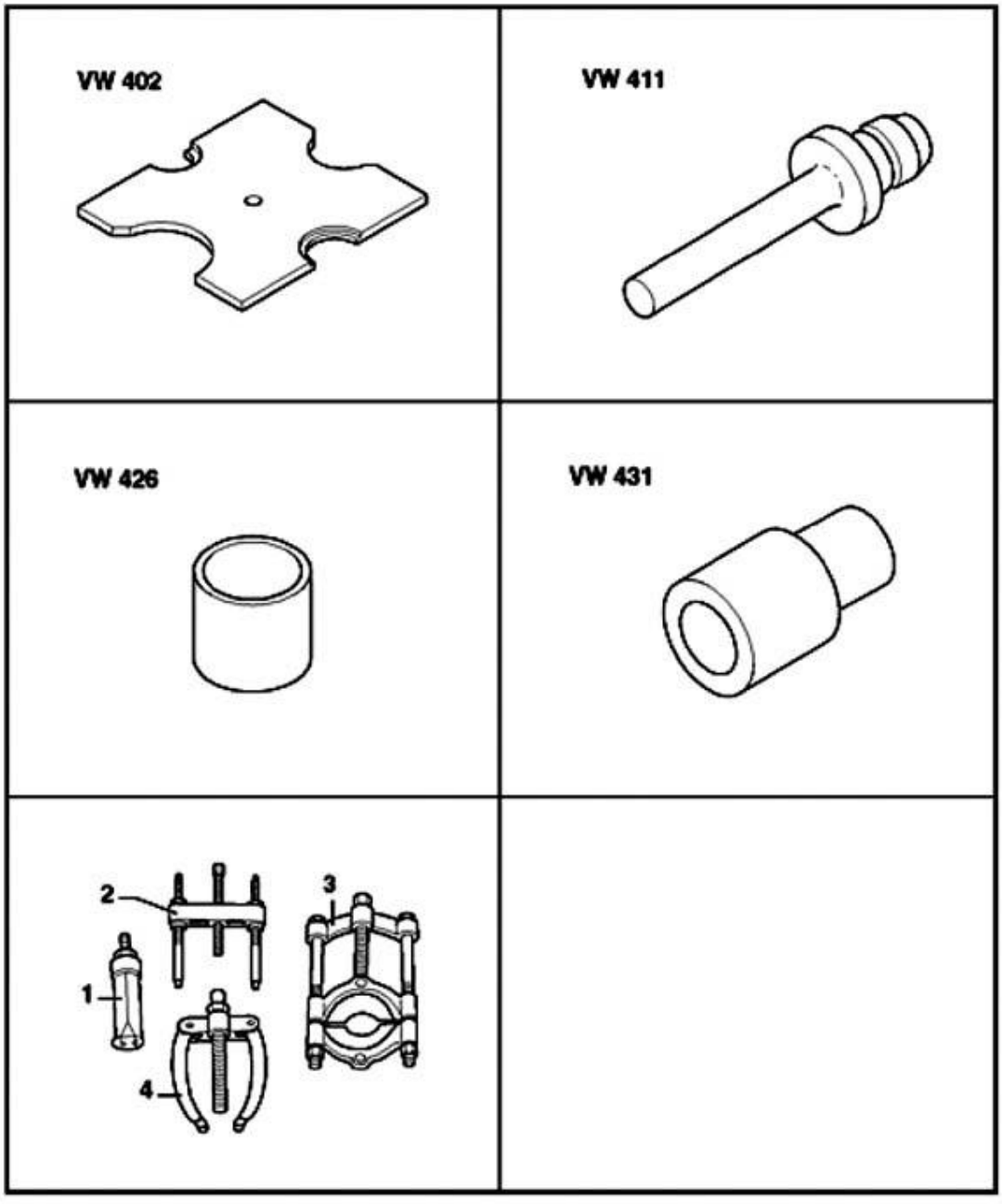
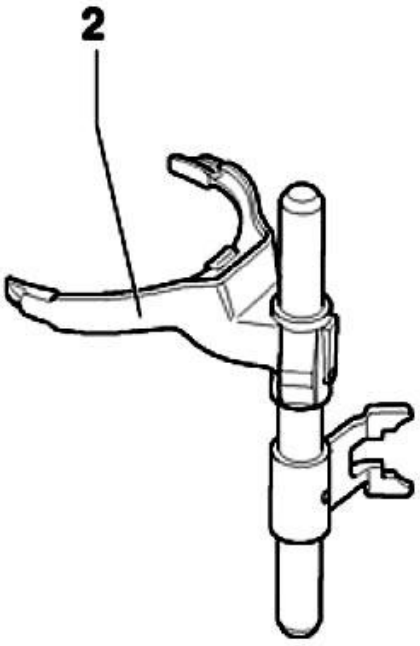


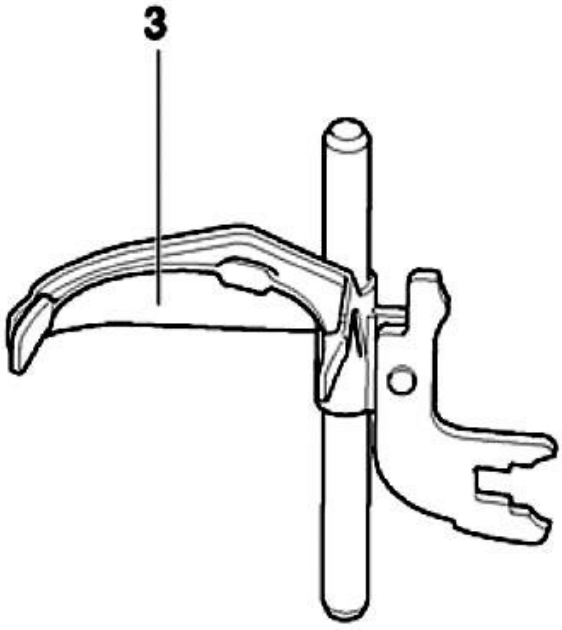
Fig. 54: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

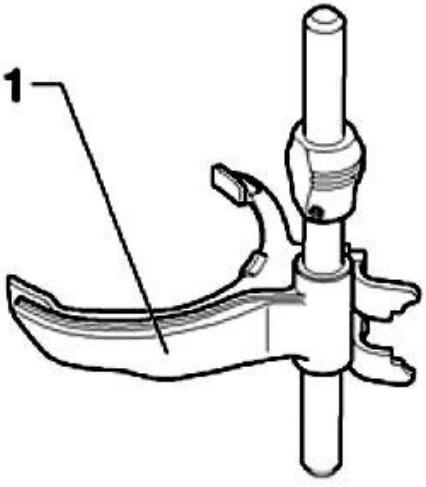
NOTE: The following list refers to items in Fig. 55 .

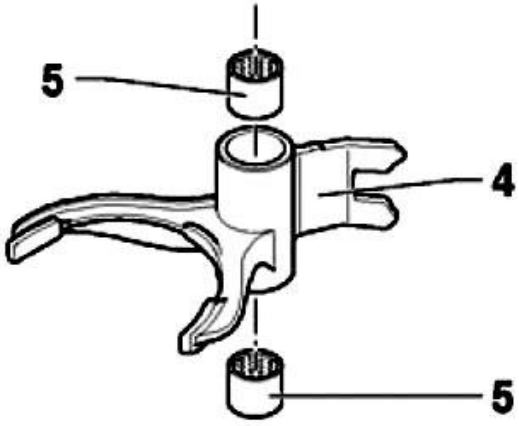
1. **Selector rod with 1st and 2nd gear selector forks**

2. **Selector rod with 3rd and 4th gear selector forks**
3. **Selector rod with 1st/2nd/5th and reverse gear selector forks**
4. **Reverse gear selector fork**
5. **Ball sleeve**
    - Pulling out. See **Pulling out reverse gear selector fork ball sleeve** .
    - Pressing in. See **Pressing in reverse gear selector fork ball sleeve** .









1 - Selector rod with 1st and 2nd gear selector forks

2 - Selector rod with 3rd and 4th gear selector forks

3 - Selector rod with 1st/2nd/5th and reverse gear selector forks

4 - Reverse gear selector fork

5 - Ball sleeve

Fig. 55: Disassembling And Assembling Selector Forks
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling out reverse gear selector fork ball sleeve

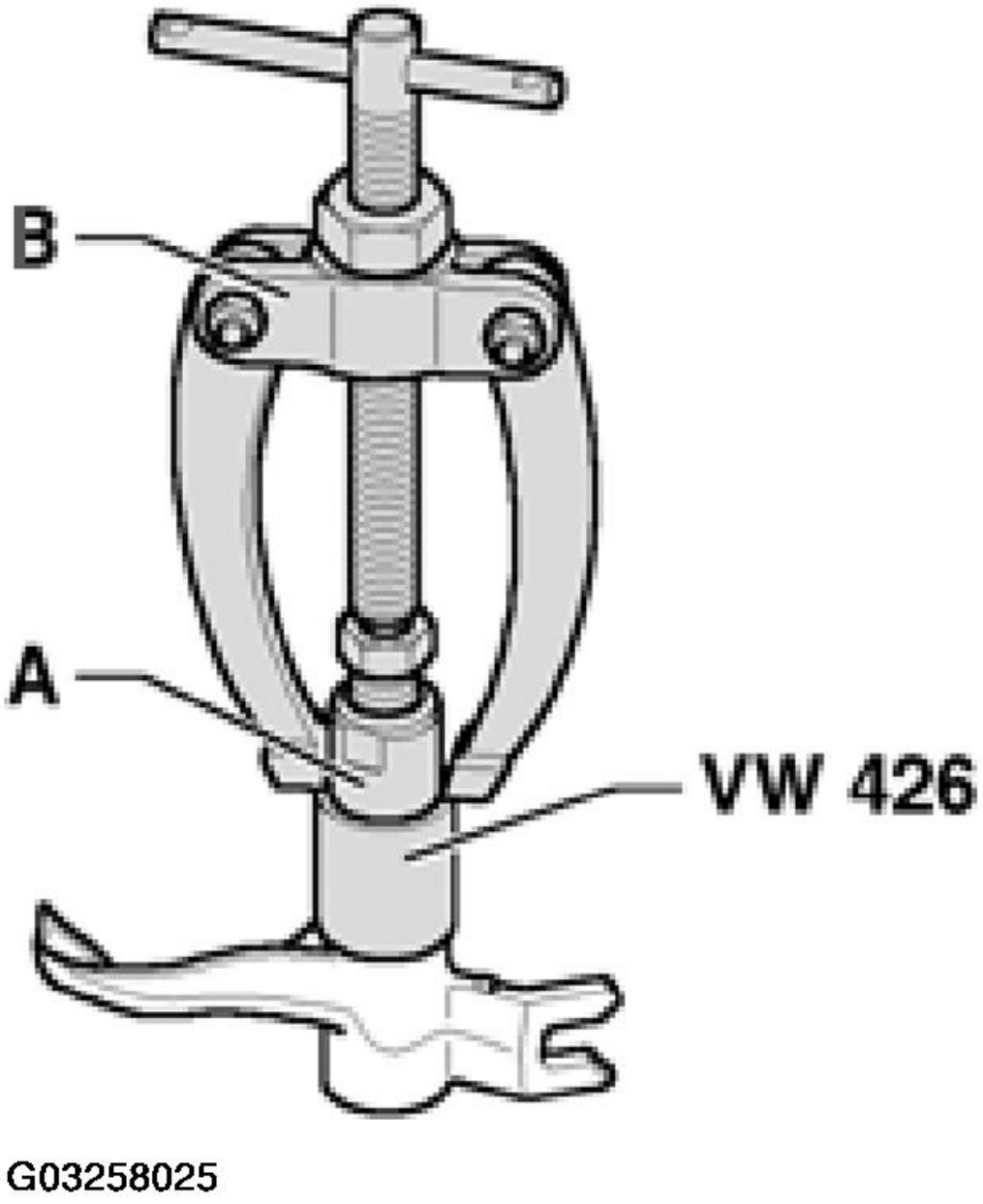


Fig. 56: Pulling Out Reverse Gear Selector Fork Ball Sleeve

Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Internal extractor 18 to 23 mm, e.g. Kukko 21/3
B. Counter support. e.g. Kukko 22/1

Pressing in reverse gear selector fork ball sleeve

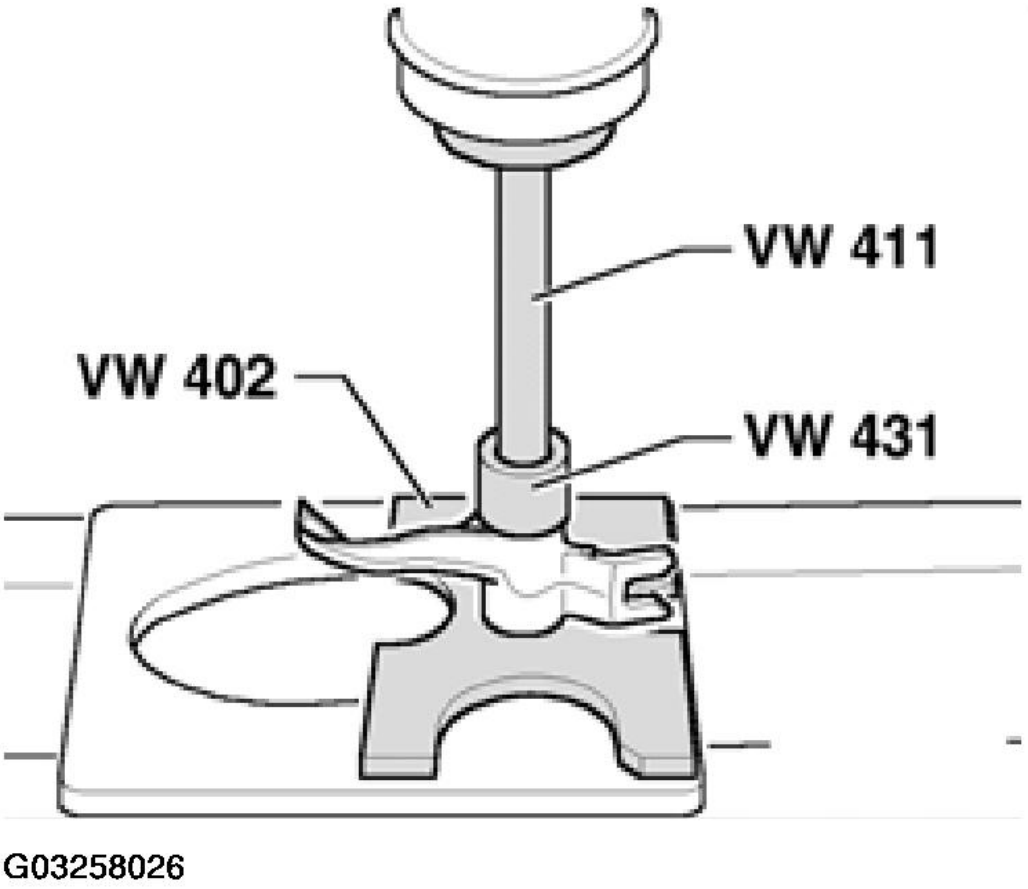


Fig. 57: Pressing In Reverse Gear Selector Fork Ball Sleeve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

MANUAL TRANSMISSION - GEARS, SHAFTS

INPUT SHAFT, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Press tool
- VW 408 A Press tool
- VW 412 Press tool
- VW 416 B Tube

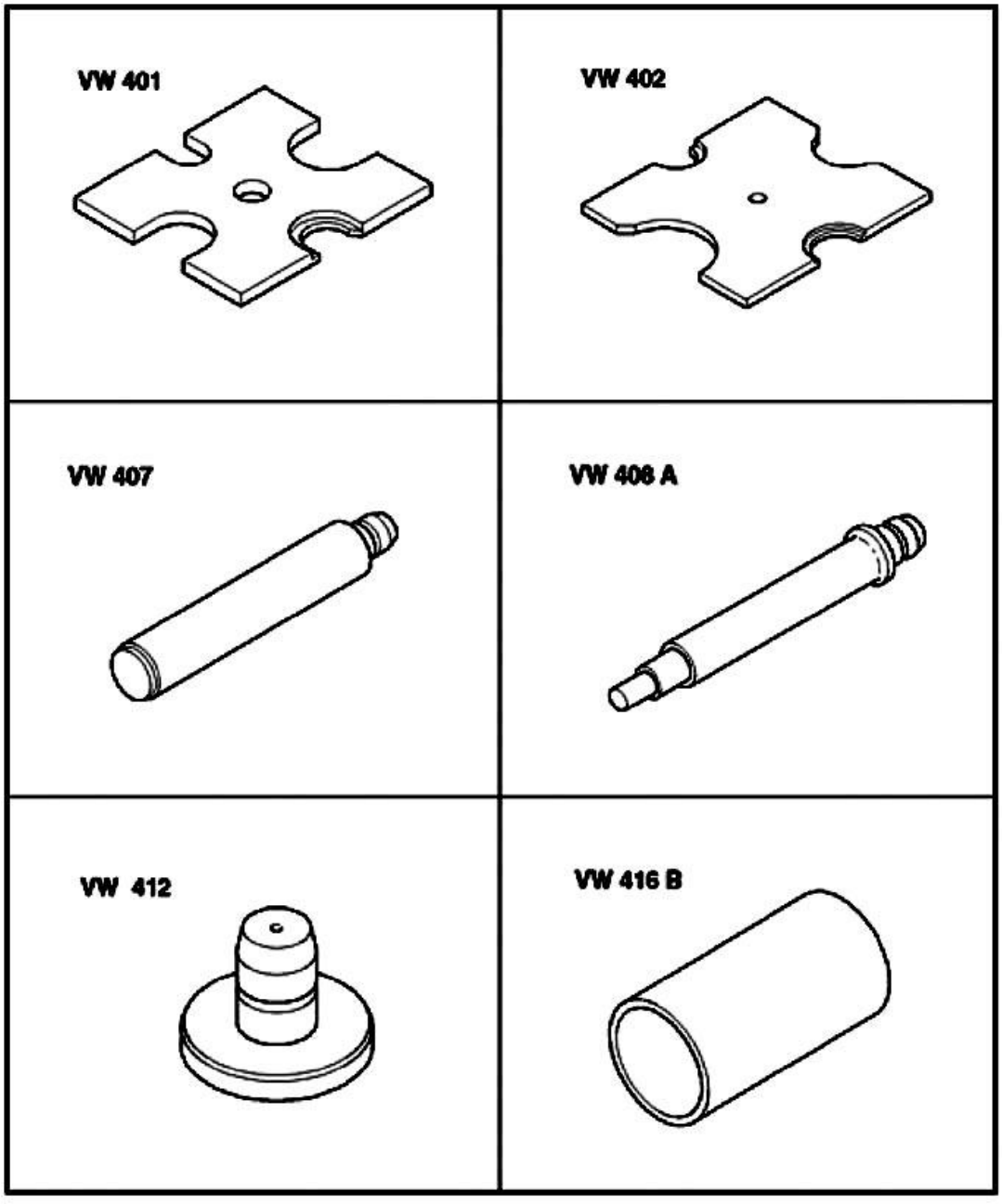


Fig. 58: Identifying Special Tools And Equipment (1 Of 4)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VW 309 Holding plate
- VW 353 Transmission support
- VW 433 Press piece

- VW 454 Press piece
- VW 457 Support rails
- VW 801 Holding plate

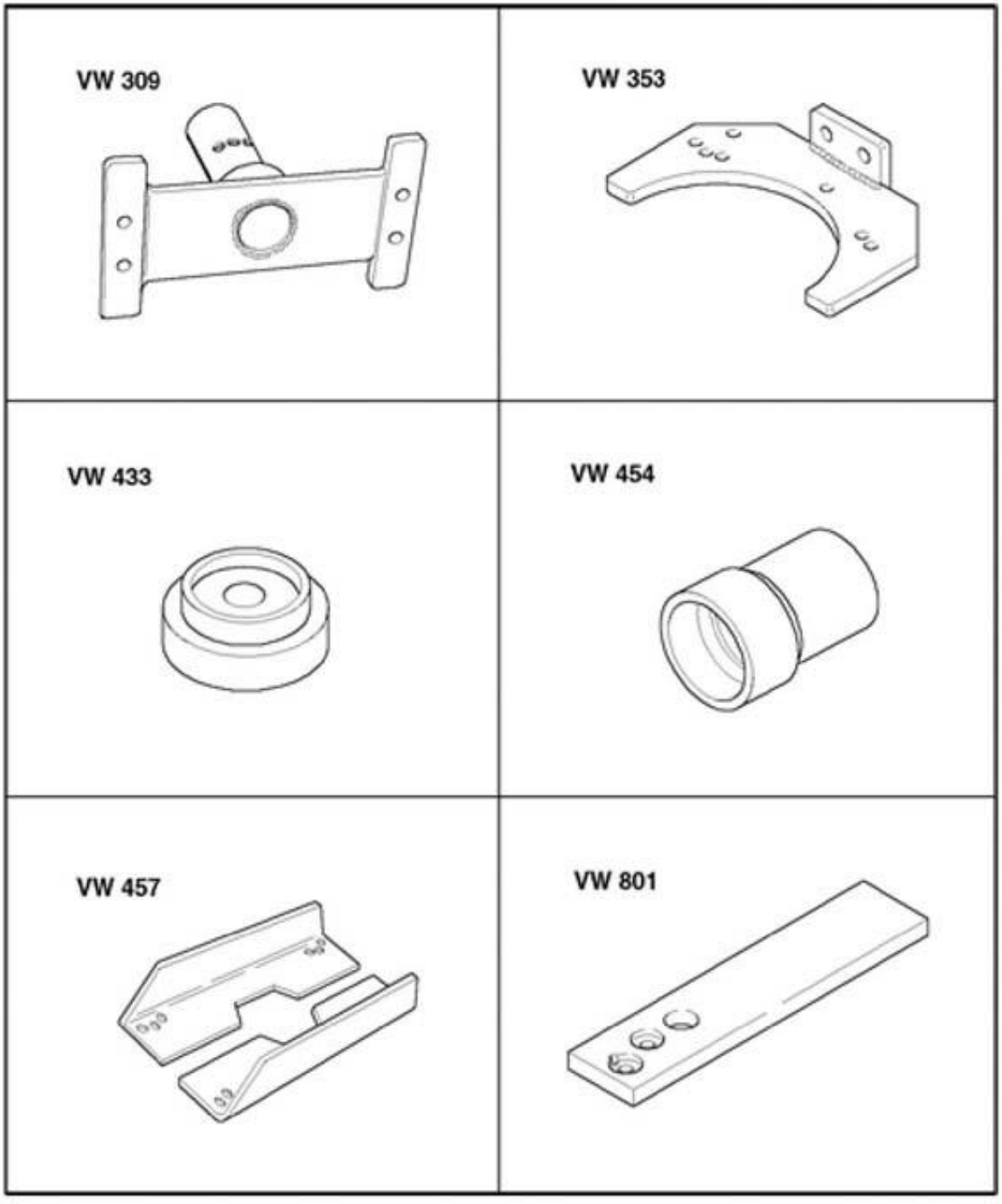


Fig. 59: Identifying Special Tools And Equipment (2 Of 4)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 40-105 Thrust plate
- 41-501 Drift sleeve
- 2040 Tube
- 2050 Thrust piece
- 3074 Press disc
- 3161 Extension

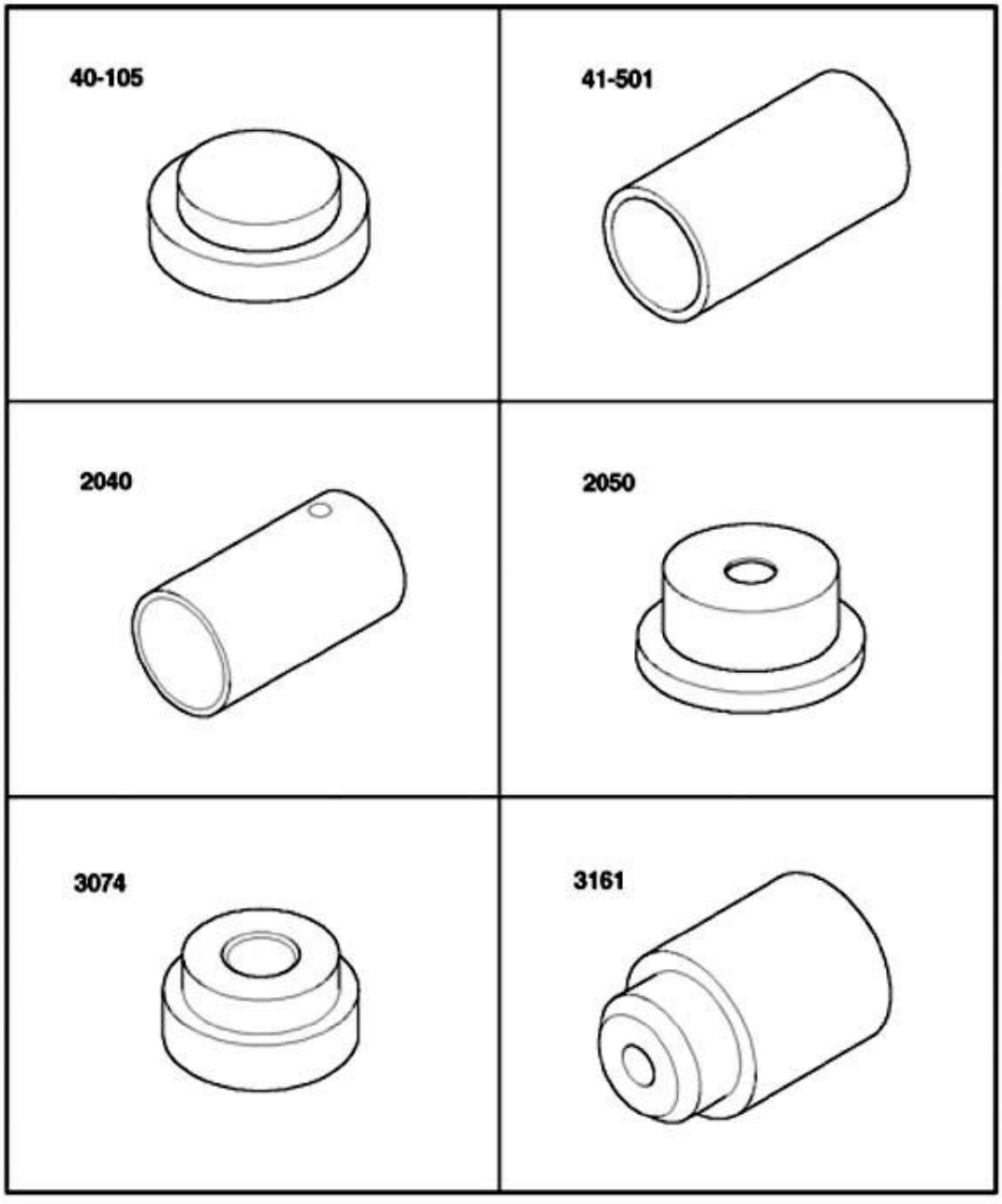


Fig. 60: Identifying Special Tools And Equipment (3 Of 4)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 3235 Press
- V.A.G 1582 Tapered roller bearing puller
- V.A.G 1582/7 Grip

- 1 -Kukko 21/7 Internal puller
- 3-Kukko 17/2 Separating device
- 4 - Kukko 22/2 Counter support

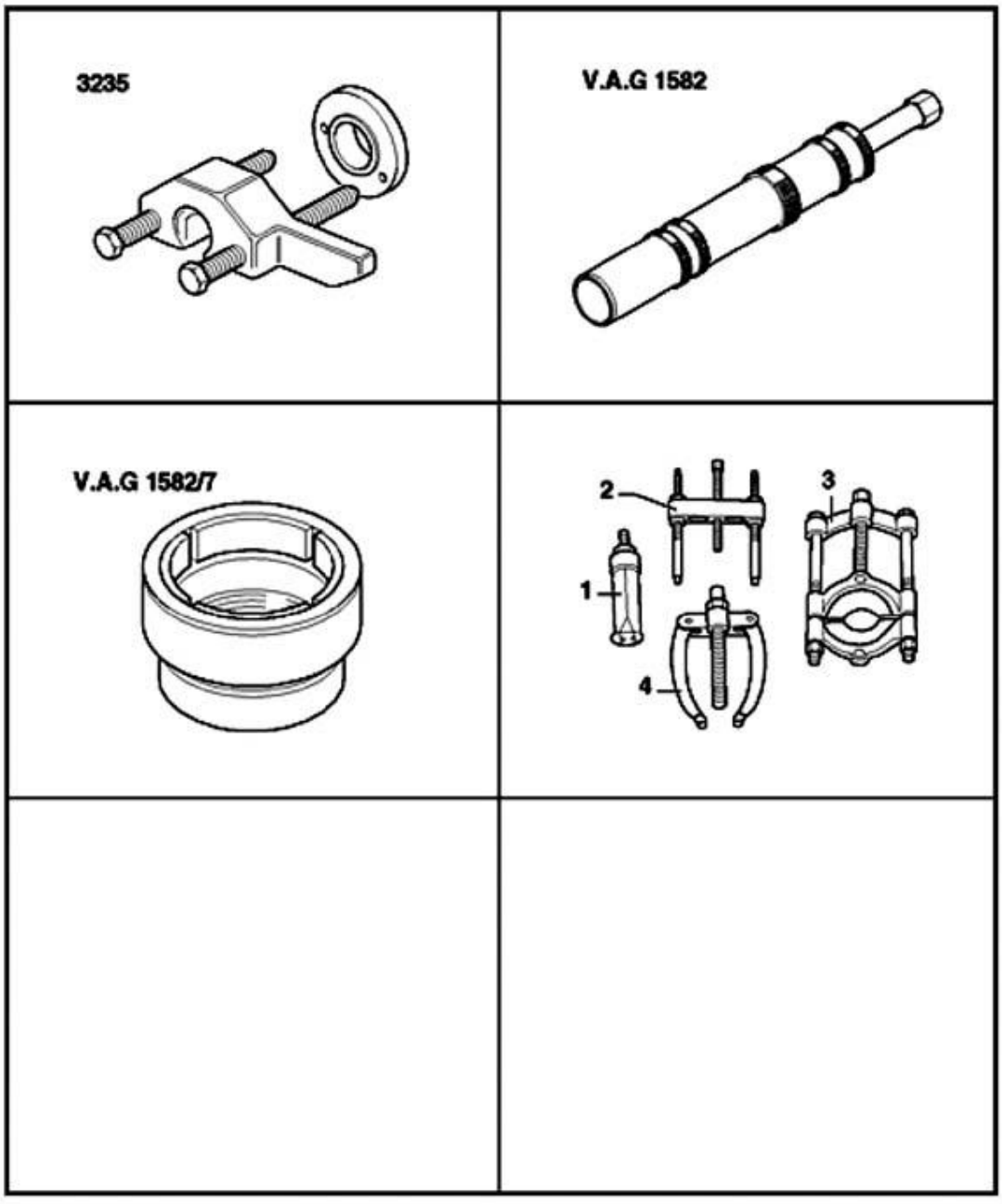


Fig. 61: Identifying Special Tools And Equipment (4 Of 4)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE:

- **When installing new gears, consult technical data. See Code letters, application, ratios, capacities .**
- **If the position of the tapered roller bearings is affected when exchanging parts, the input shaft must be readjusted. See adjustment overview. See Adjustment overview .**

NOTE: The following list refers to items in Fig. 62 .

1. **Transmission housing**
2. **Shim**
   - Determining thickness. See **INPUT SHAFT, ADJUSTING** .
3. **Tapered roller bearing outer race**
   - Pulling out. See **Pressing tapered roller bearing outer race out of transmission housing** .
   - Pressing in. See **Pressing tapered roller bearing outer race into transmission housing** .
4. **Circlip**
   - Redetermine if tapered roller bearing -item -5- or input shaft -item 8- are replaced. See **Determining thickness of circlip** .
5. **Tapered roller bearing inner race**
   - Pulling off. See **Pulling off tapered roller bearing inner race** .
   - Pressing on **Pressing on tapered roller bearing inner race** .
6. **5th gear**
   - Pressing off. See **Pressing off 5th gear** .
   - Pressing on **Pressing on 5th gear** .
7. **3rd, 4th and 6th gear**
   - Pressing off. See **Pressing off 3rd, 4th and 6th gear** .
   - Pressing on **Pressing on 3rd, 4th and 6th gear** .
8. **Input shaft**
   - Adjusting. See **INPUT SHAFT, ADJUSTING** .
9. **Tapered roller bearing inner race**
   - Pressing off. See **Pressing off tapered roller bearing inner race** .
   - Pressing on **Pressing on tapered roller bearing inner race** .
10. **Tapered roller bearing outer race**
    - Pulling out. See **Pulling tapered roller bearing outer race out of transmission housing** .
    - Pressing in. See **Pressing in tapered roller bearing outer race** .
11. **Clutch housing**

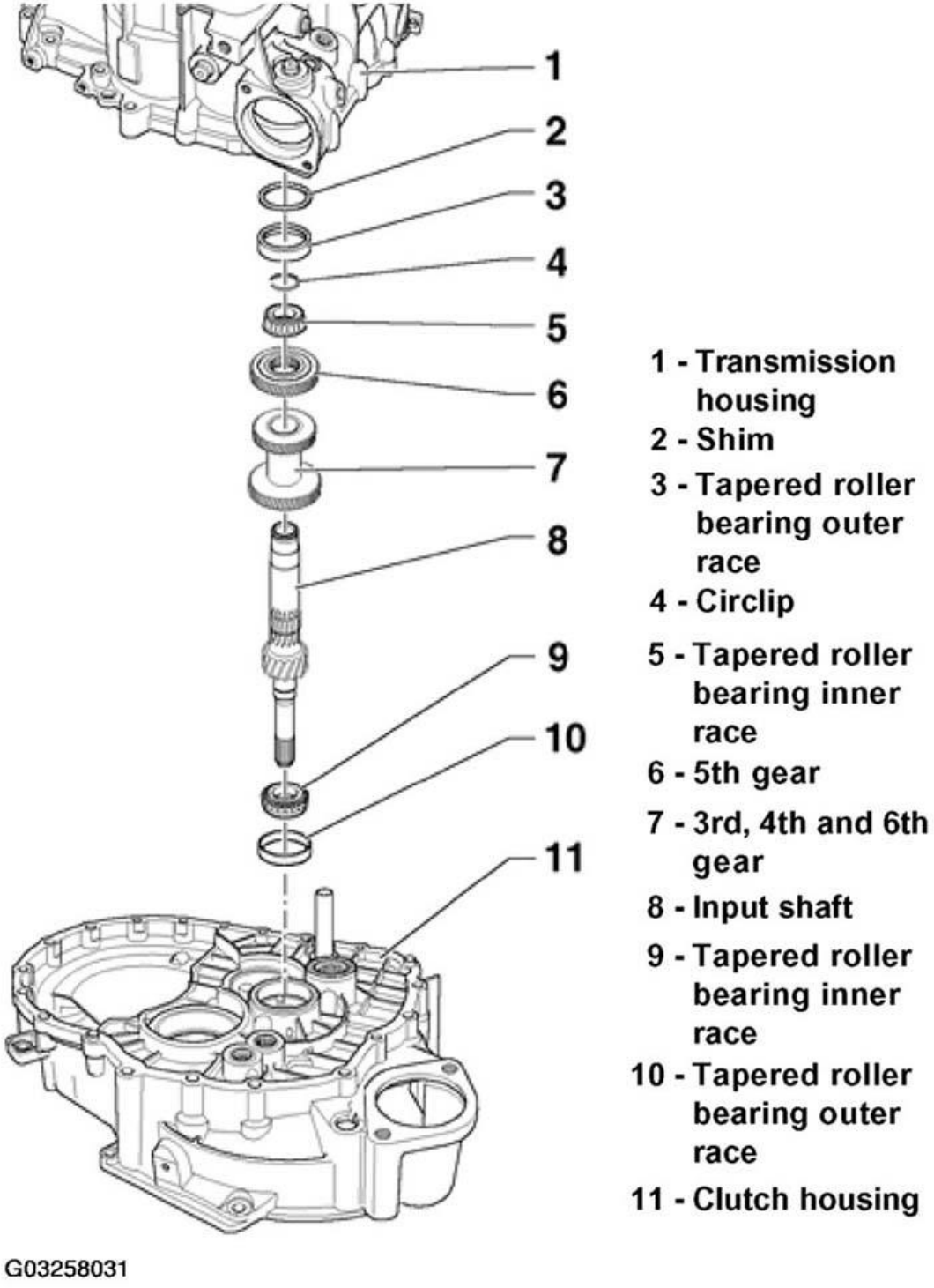


Fig. 62: Disassembling And Assembling Input Shaft Components
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing tapered roller bearing outer race out of transmission housing

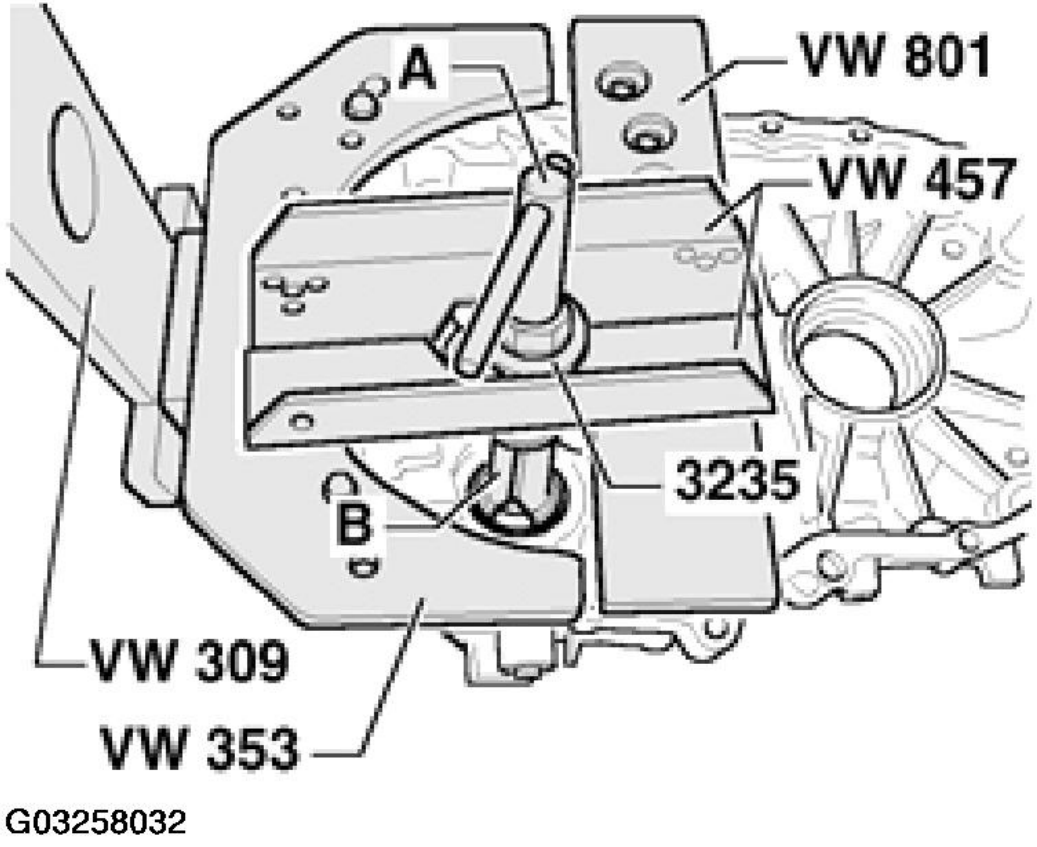


Fig. 63: Pressing Tapered Roller Bearing Outer Race Out Of Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Counter support, e.g. Kukko 22/2
B. Internal puller 46 to 58 mm, e.g. Kukko 21/7

Pressing tapered roller bearing outer race into transmission housing

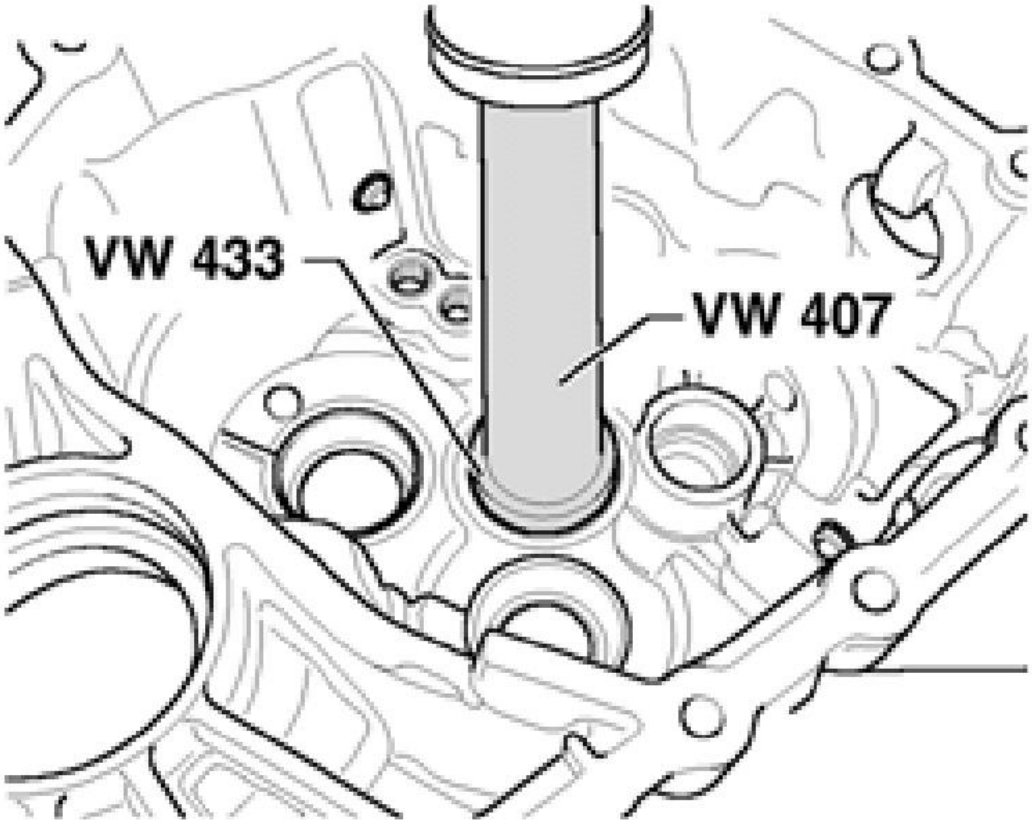


Fig. 64: Pressing Tapered Roller Bearing Outer Race Into Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Support transmission housing with press piece 3062 directly below bearing support.

Pulling off tapered roller bearing inner race

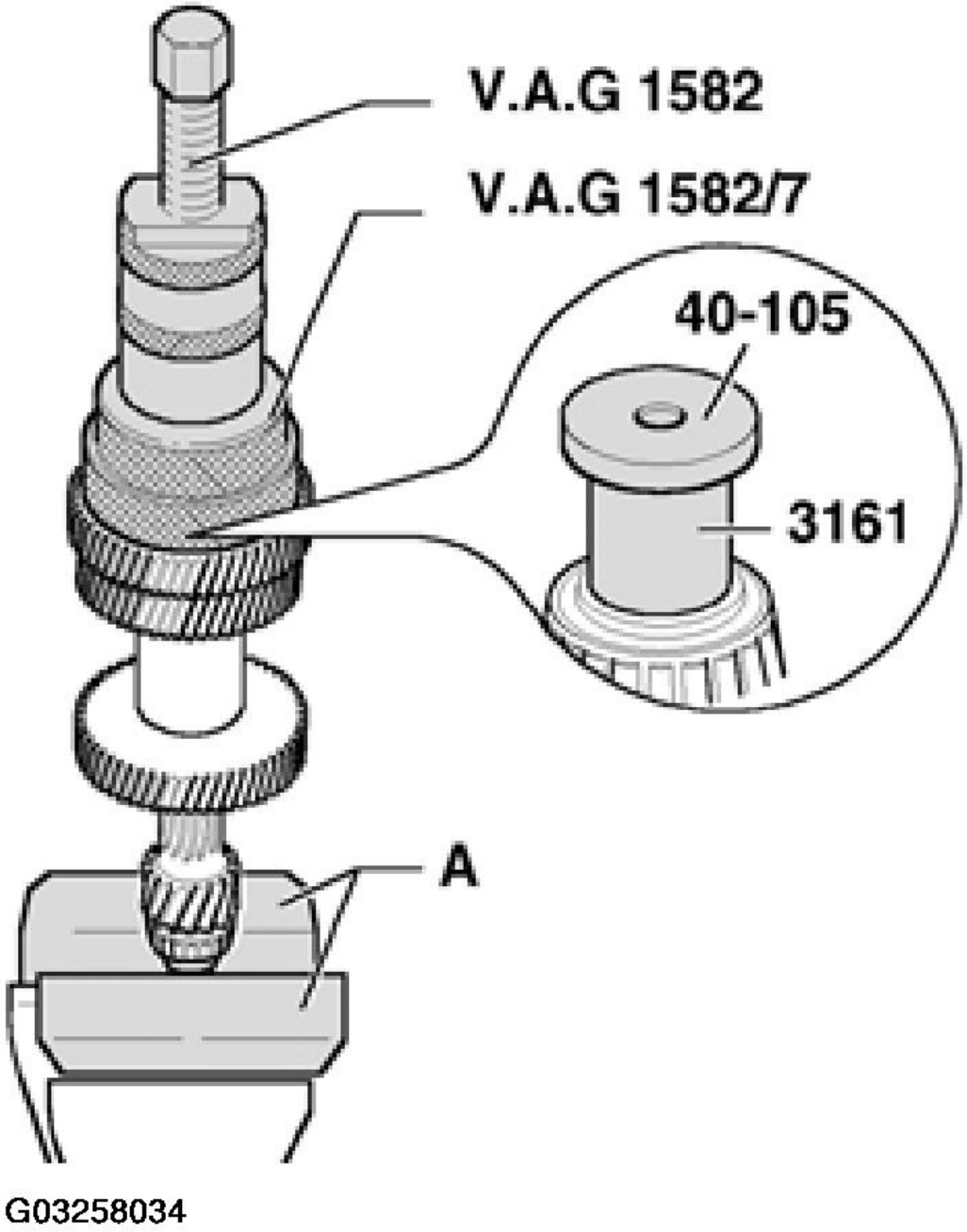


Fig. 65: Pulling Off Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Vice clamps/vice

- Before setting up pulling device, set extension 3161 and thrust plate 40-105 on input shaft.

Pressing off 5th gear

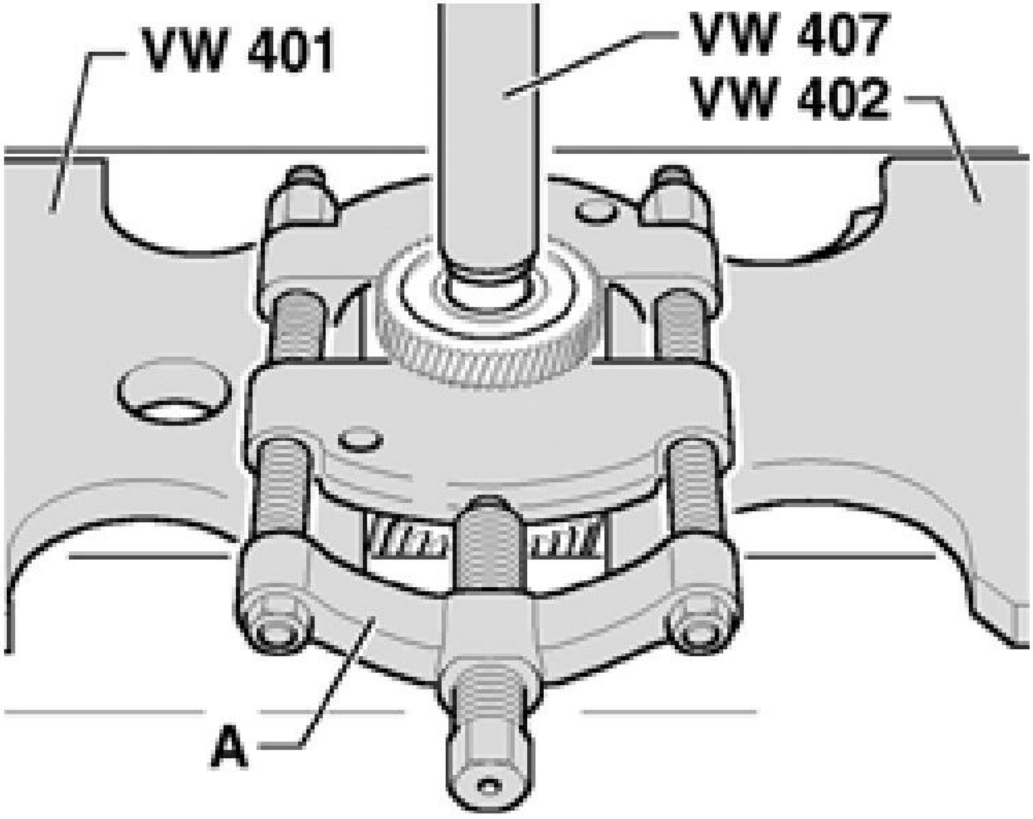


Fig. 66: Pressing Off 5Th Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Separating device 22 to 115 mm, e.g. Kukko 17/2

Pressing off 3rd, 4th and 6th gear

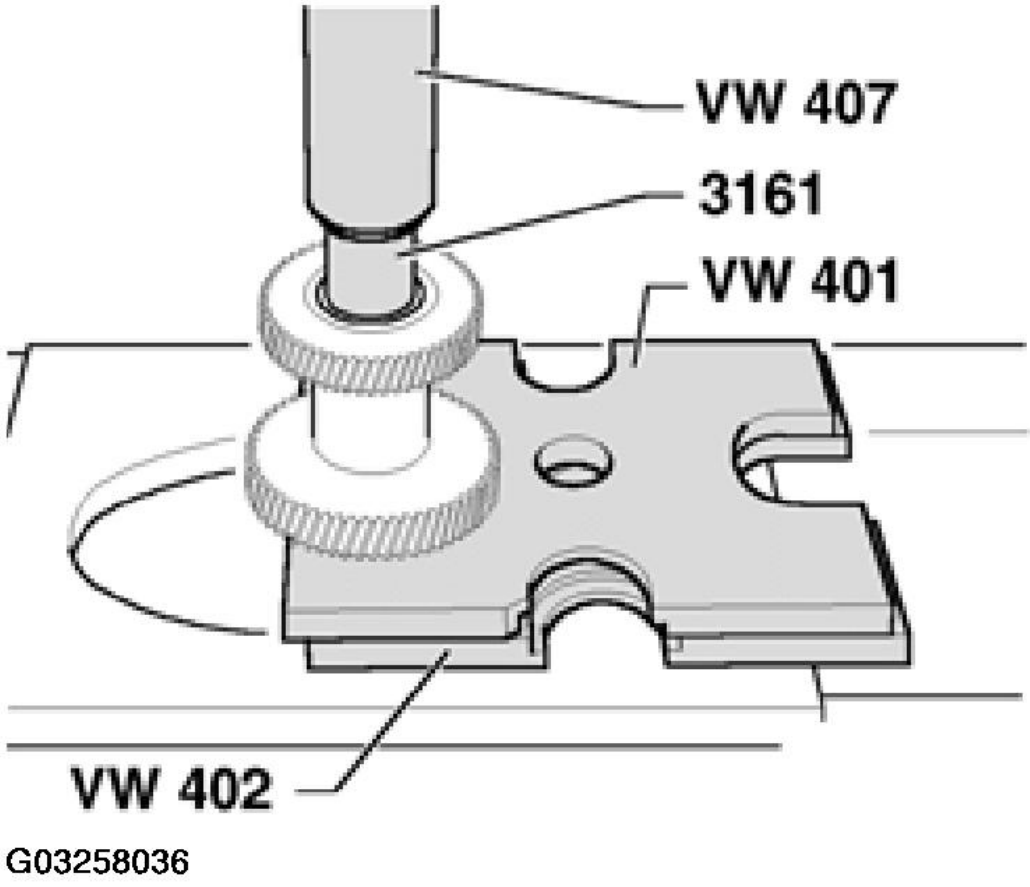


Fig. 67: Pressing Off 3rd, 4th And 6th Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing off tapered roller bearing inner race

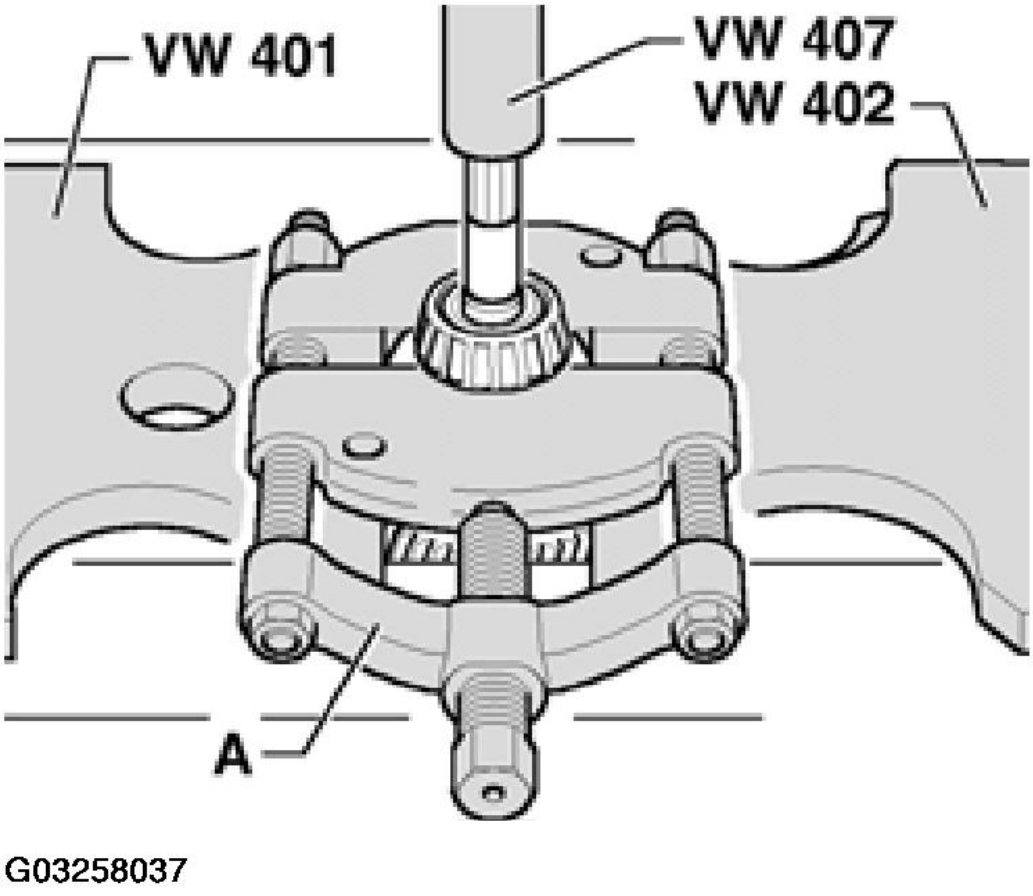


Fig. 68: Pressing Off Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Separating device 22 to 115 mm, e.g. Kukko 17/2

Pressing on 3rd, 4th and 6th gear

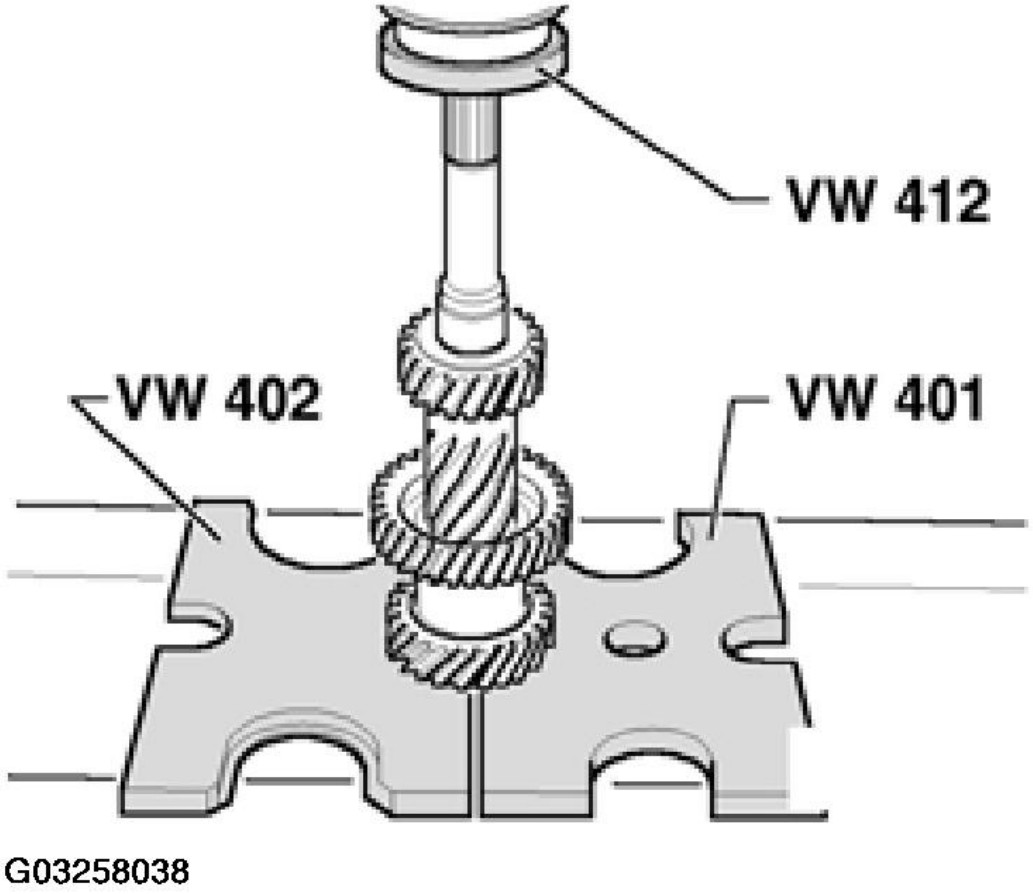


Fig. 69: Pressing On 3Rd, 4th And 6th Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Heat gear wheel to about 100°C
- Press on gear wheel quickly so that heat is not immediately transferred to input shaft.

Pressing on tapered roller bearing inner race

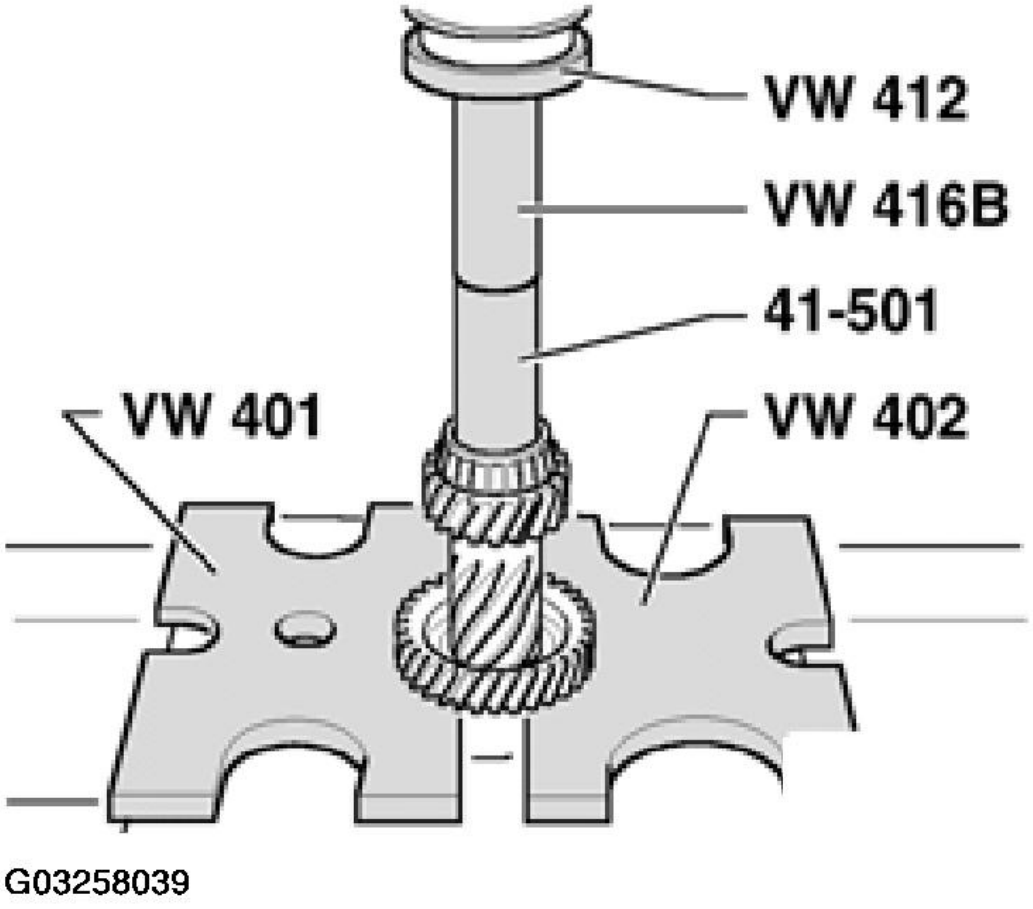


Fig. 70: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing on 5th gear

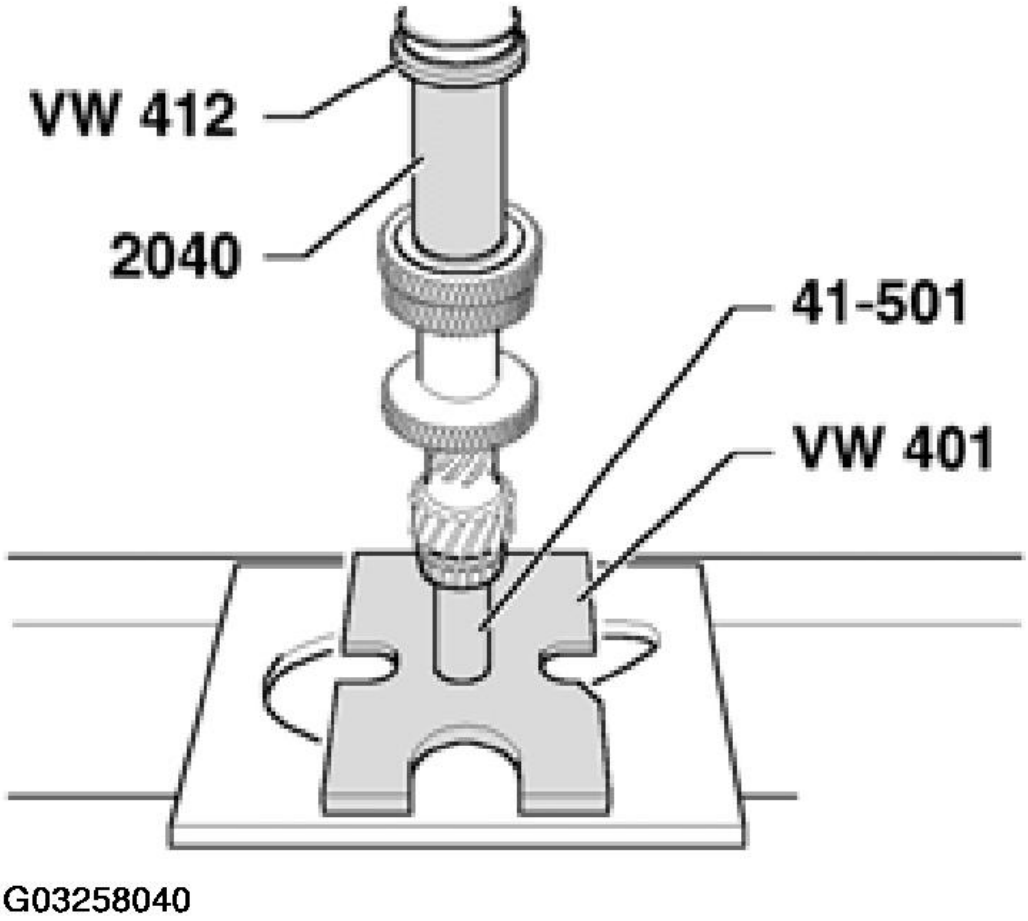


Fig. 71: Pressing On 5th Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing on tapered roller bearing inner race

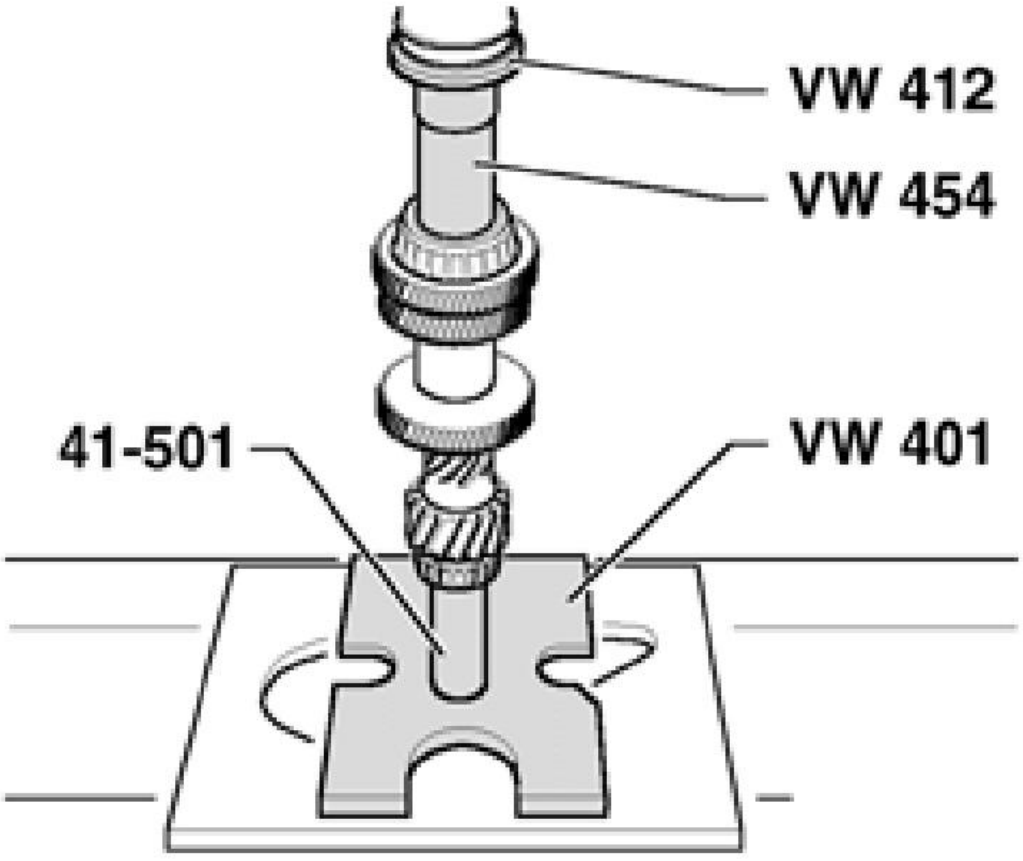


Fig. 72: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Determining thickness of circlip

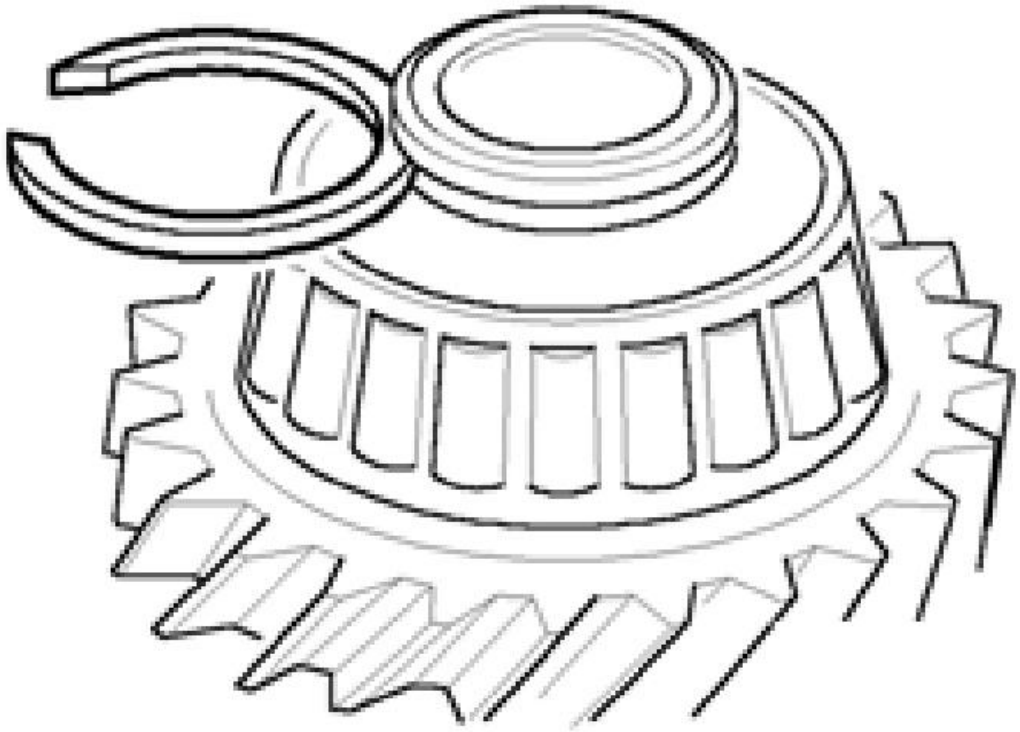


Fig. 73: Determining Thickness Of Circlip
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Determine thickest circlip which will just fit and install it.

The following circlips are available:

CIRCLIP THICKNESS AVAILABILITY

Thickness (mm)	Spare Part No.
1.79	02M 3111 187 G
1.83	02M 3111 187 F
1.86	02M 3111 187 E
1.89	02M 3111 187 D
1.92	02M 3111 187 C
1.95	02M 3111 187 B
1.98	02M 3111 187 A

Pulling tapered roller bearing outer race out of transmission housing

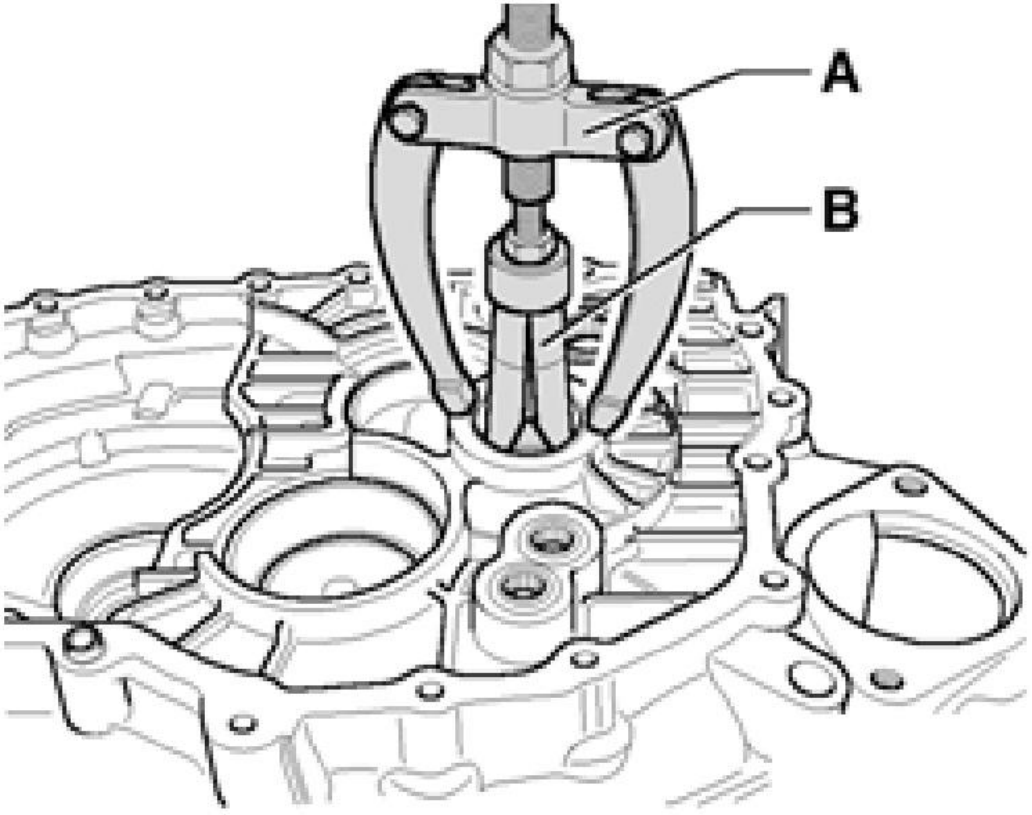


Fig. 74: Pulling Tapered Roller Bearing Outer Race Out Of Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Counter support, e.g. Kukko 22/2
B. B - Internal puller 46 to 58 mm, e.g. Kukko 21/7

Pressing in tapered roller bearing outer race

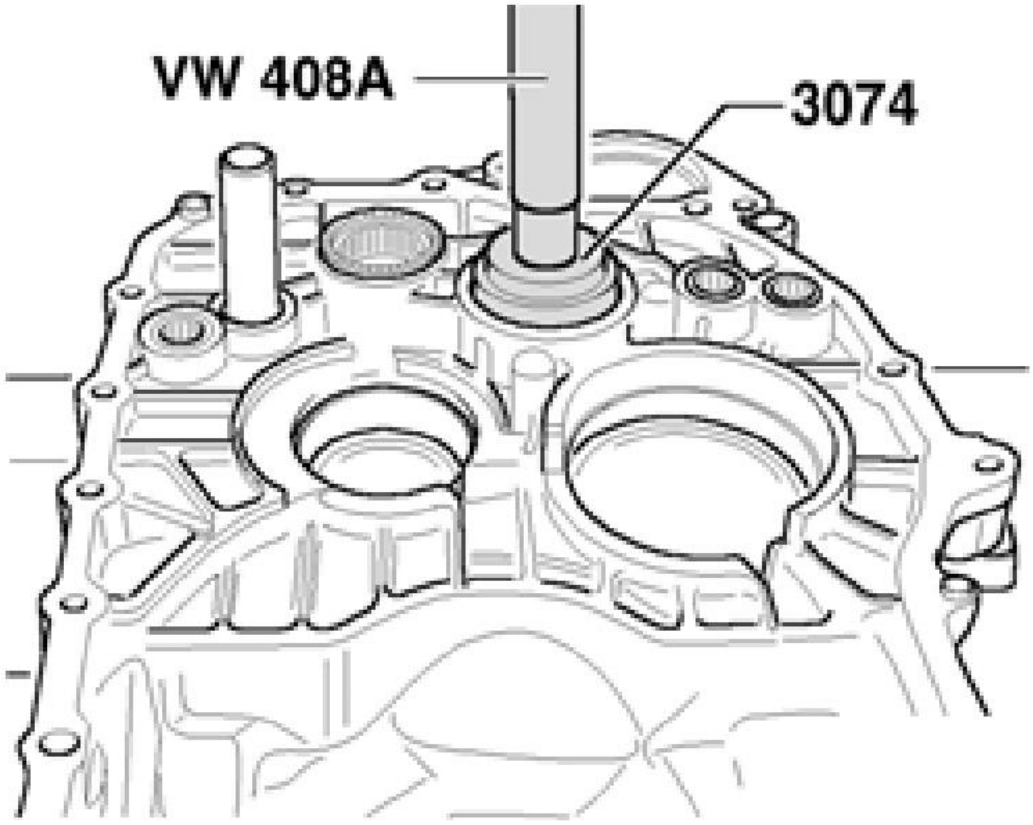


Fig. 75: Pressing In Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

INPUT SHAFT, ADJUSTING

(Determining input shaft adjustment shim)

Special tools and equipment

- VW 309 Holding plate
- VW 353 Transmission support
- VW 385/17 End measuring plate
- VW 387 Universal dial gauge bracket
- VW 407 Press tool
- VW 433 Press piece

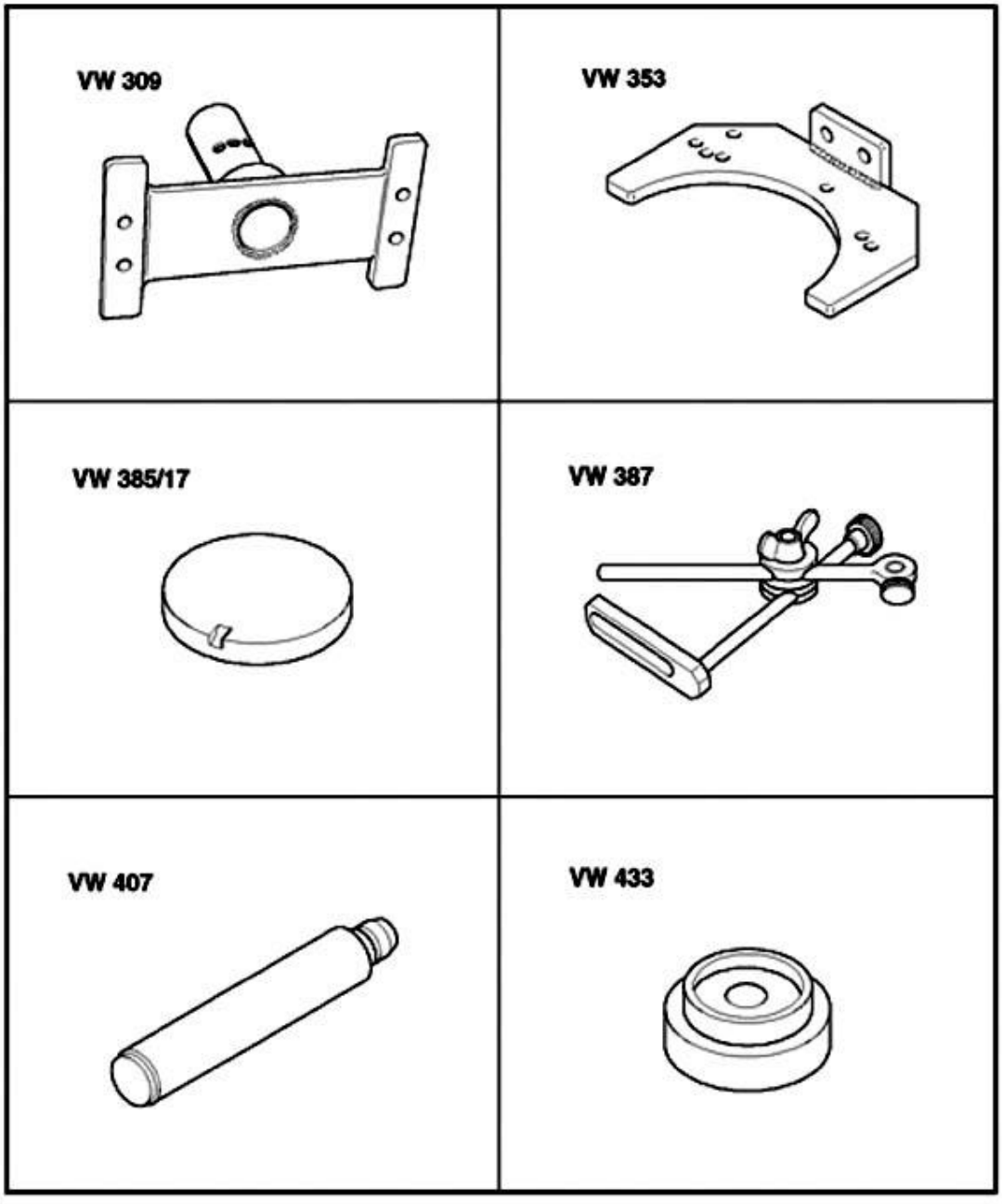


Fig. 76: Identifying Special Tools And Equipment (1 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VW 457 Support rails
- VW 801 Holding plate
- V.A.G 1331 Torque wrench

- 1 -Kukko 21/7 Internal puller
- 4 - Kukko 22/1 Counter-support

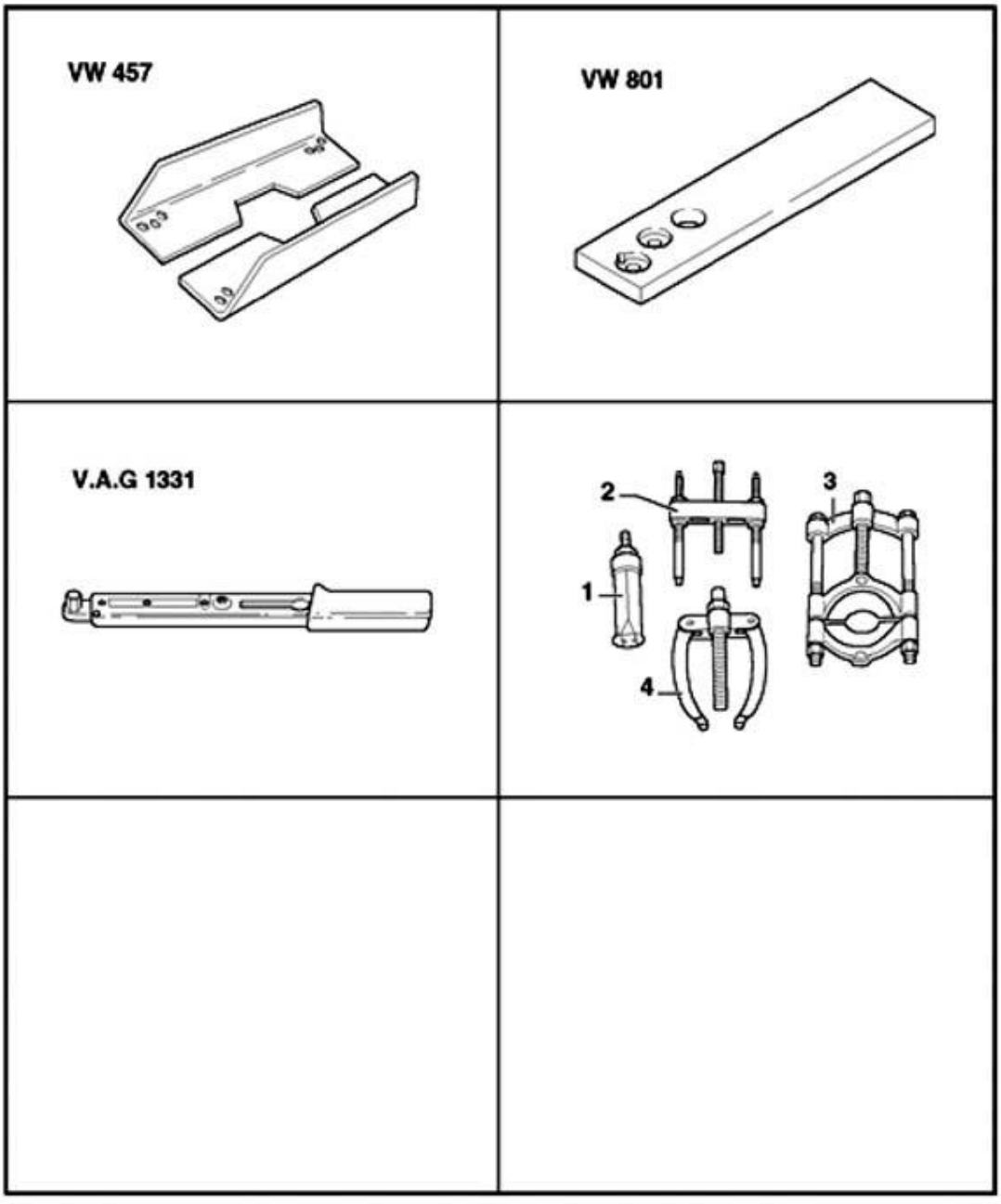


Fig. 77: Identifying Special Tools And Equipment (2 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

It is only necessary to readjust the input shaft when the following components are replaced:

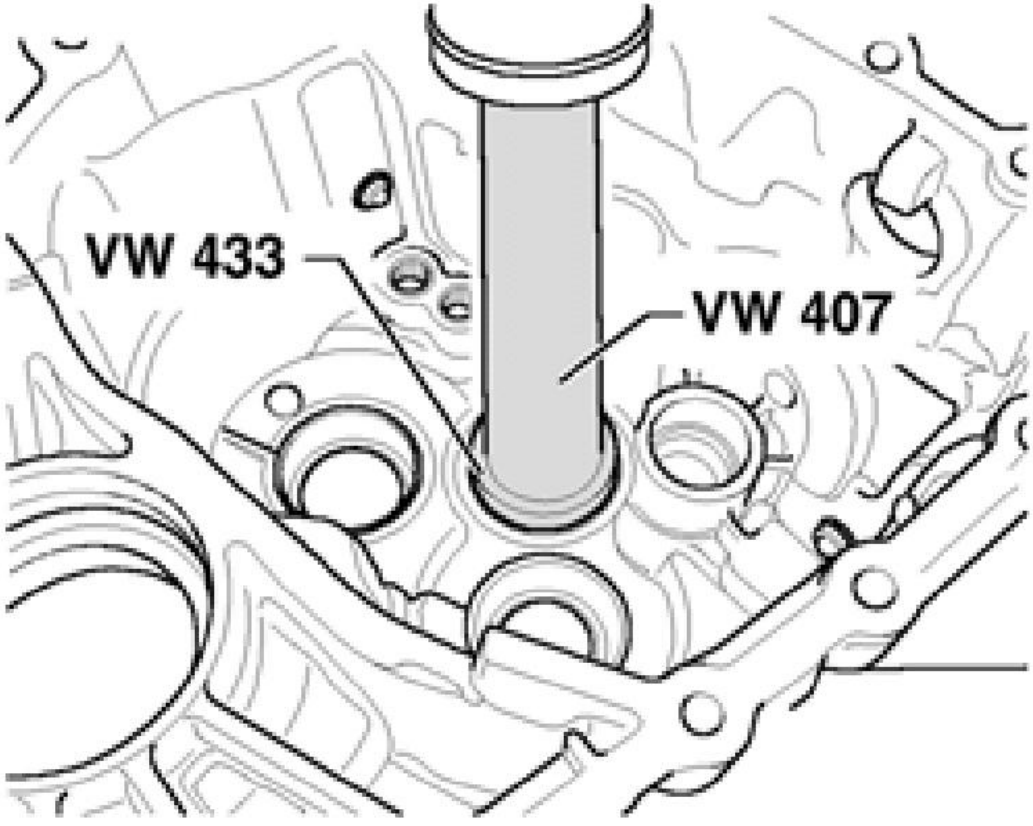
- Transmission housing
- Clutch housing
- Input shaft

or the

- Tapered roller bearings

  Adjustment overview. See **Adjustment overview** .

- Shims of determined thickness are installed for both output shafts.
- Press tapered roller bearing outer race without shim into transmission housing onto stop.



G03258047

Fig. 78: Pressing Tapered Roller Bearing Outer Race Without Shim Into Transmission Housing Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install both output shafts and input shaft in clutch housing and assemble transmission housing. Tighten hex head bolts to 25 N.m and then turn 45 (1/8 turn) further.
- Mount measuring appliance and dial gauge in clutch housing.

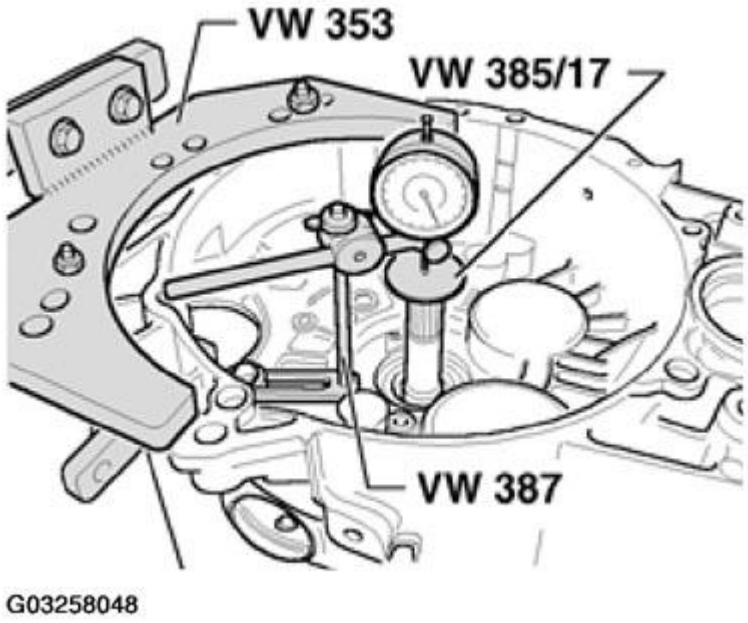


Fig. 79: Mounting Measuring Appliance And Dial Gauge In Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Before taking any measurements, rotate input shaft to allow bearings to settle. Set dial gauge to "O" with 1 mm preload.

NOTE: This preparation is to be repeated for each subsequent measurement, otherwise the gauge will not return to the starting position.

- Pull input shaft in direction of dial gauge.
- Read and note clearance indicated on dial gauge.

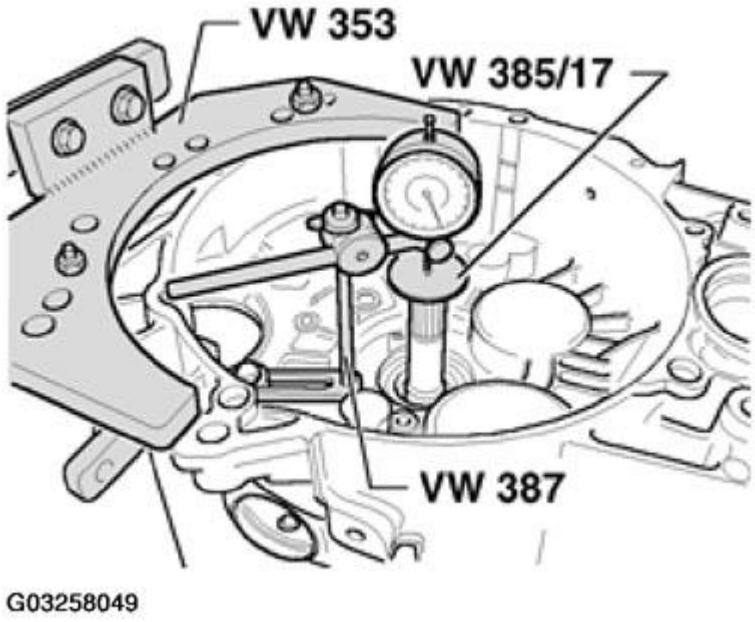


Fig. 80: Reading Clearance Indicated On Dial Gauge
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Determine thickness of shim from table. See **TABLE OF ADJUSTMENT SHIMS** .
- Remove input shaft and pull tapered roller bearing outer race out of transmission housing.

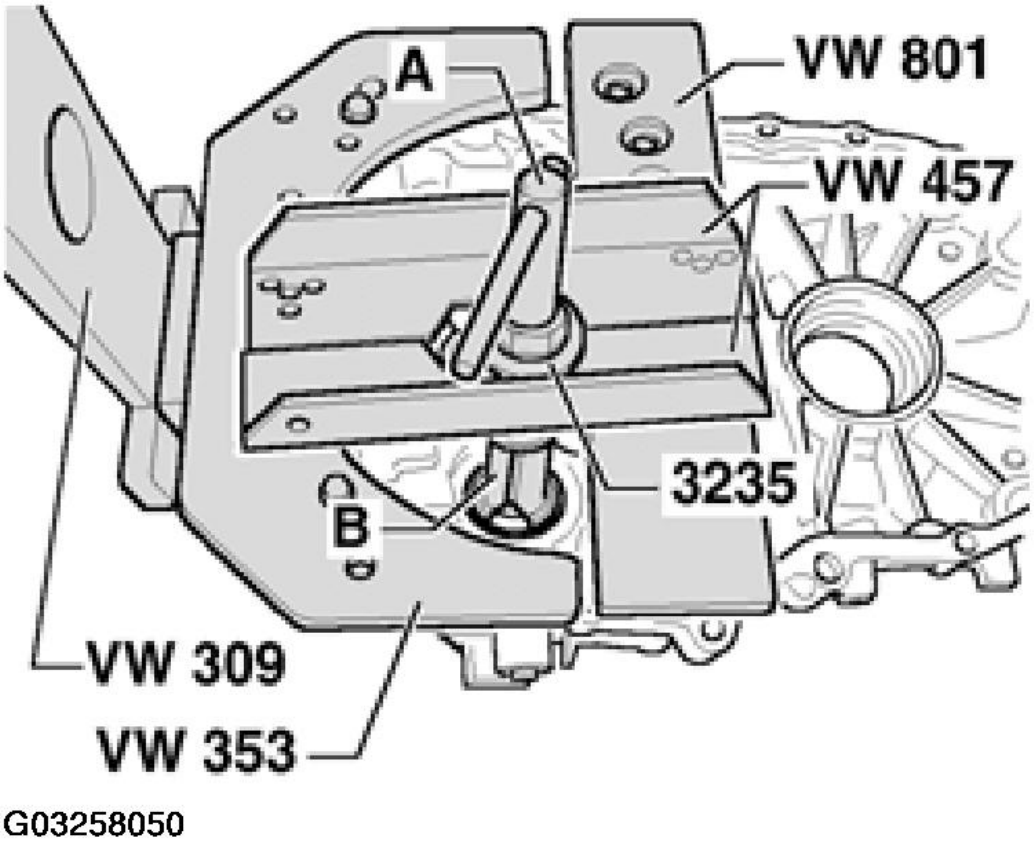


Fig. 81: Removing Input Shaft And Pulling Tapered Roller Bearing Outer Race Out Of Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Counter support, e.g. Kukko 22/2
B. Internal puller 46 to 58 mm, e.g. Kukko 21/7

- Press tapered roller bearing outer race together with 1.60 shim into transmission housing using VW 510.
- Assemble transmission housing and tighten new hex head bolts to 25 N.m and then turn 45 (1/8 turn) further.

Table of adjustment shims

TABLE OF ADJUSTMENT SHIMS (INPUT SHAFT)

Measured	Shim	
bearing clearance (mm)	Thickness (mm)	Part No.
1.480 ... 1.524	1.45	084 409 383 AG

1.525 ... 1.574	1.50	084 409 383 AH
1.575 ... 1.624	1.55	084 409 383 AJ
1.625 ... 1.674	1.60	084 409 383 AK
1.675 ... 1.724	1.65	084 409 383 AL
1.725 ... 1.774	1.70	084 409 383 AM
1.775 ... 1.824	1.75	084 409 383 AN
1.825 ... 1.874	1.80	084 409 383 AP
1.875 ... 1.924	1.85	084 409 383 AQ
1.925 ... 1.974	1.90	084 409 383 AR
1.975 ... 2.024	1.95	084 409 383 AS
2.025 ... 2.074	2.00	084 409 383 AT
2.075 ... 2.124	2.05	084 409 383 BA
2.125 ... 2.174	2.10	084 409 383 BB
2.175 ... 2.224	2.15	084 409 383 BC
2.225 ... 2.274	2.20	084 409 383 BD
2.275 ... 2.324	2.25	084 409 383 BE
2.325 ... 2.374	2.30	084 409 383 BF

Measurement check

- Install measuring appliance and dial gauge

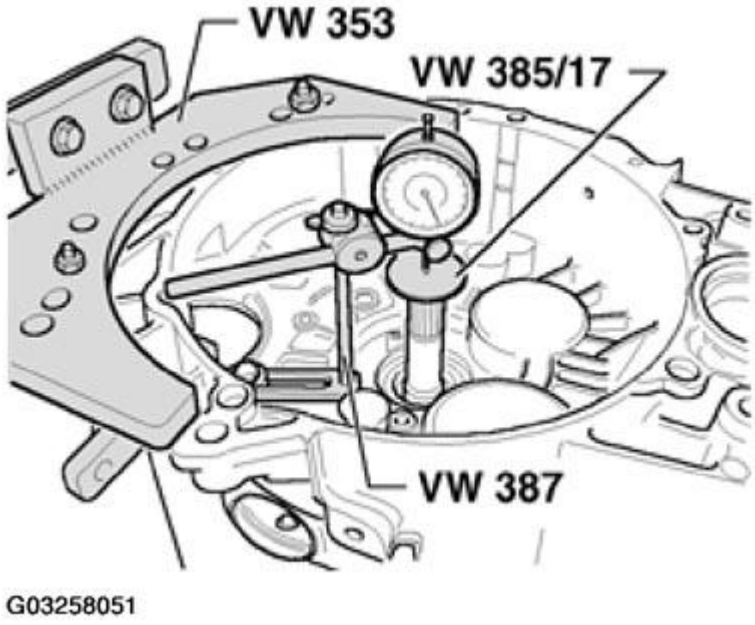


Fig. 82: Installing Measuring Appliance And Dial Gauge

Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Rotate input shaft so that tapered roller bearings settle.
- Press input shaft in direction of dial gauge.
- Bearing play should be min. 0.015 to max. 0.100 mm.

NOTE: If the bearing clearance cannot be measured, but input shaft play is perceptible and the input shaft turns freely, the adjustment is acceptable.

OUTPUT SHAFT, 1ST-4TH GEAR, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Press tool
- VW 408 A Press tool
- VW 412 Press tool
- VW 415 A Tube

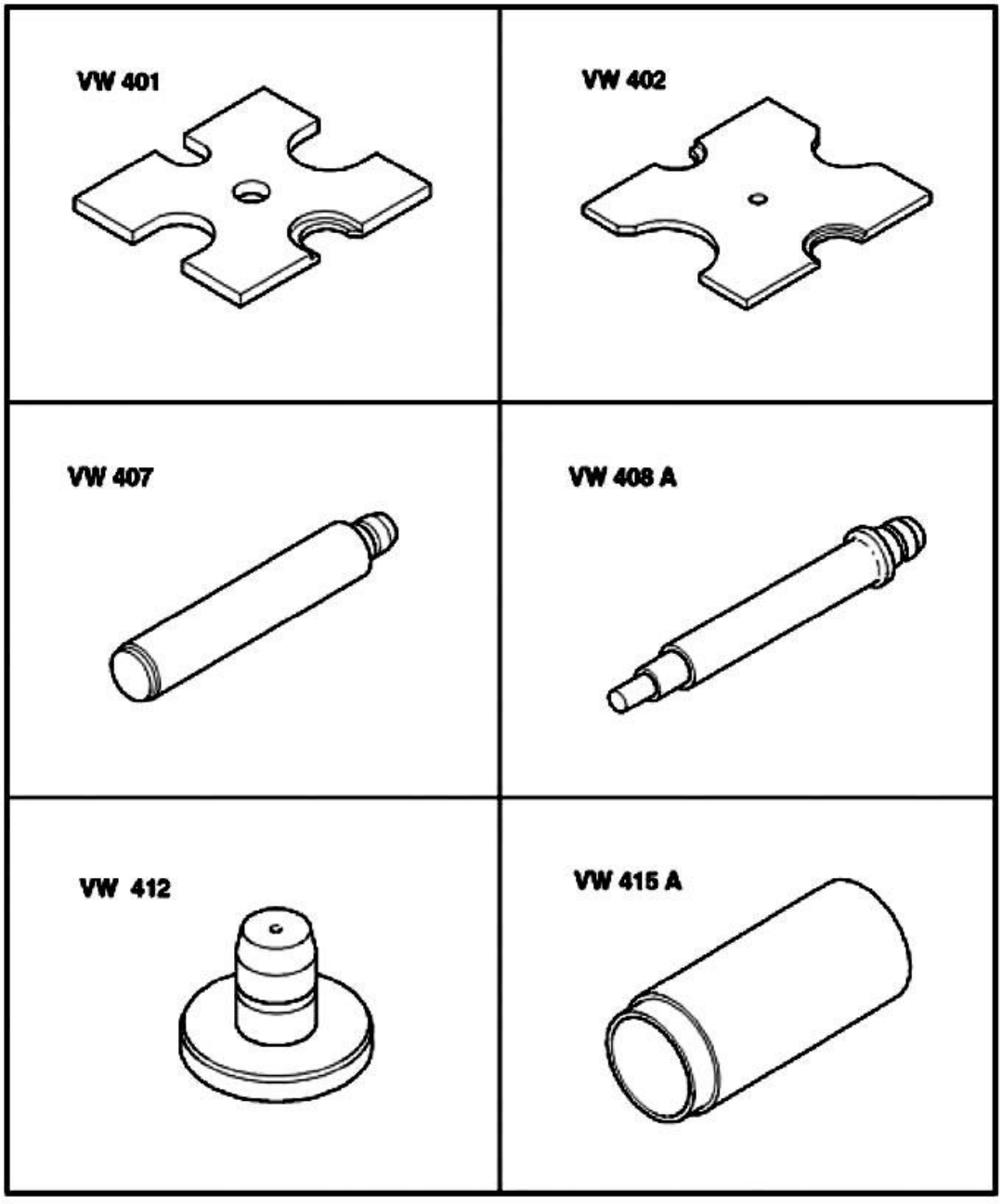


Fig. 83: Identifying Special Tools And Equipment (1 Of 4)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VW 309 Holding plate
- VW 313 Support clamp
- VW 353 Transmission support

- VW 431 Press piece
- VW 433 Press piece
- VW 454 Press piece

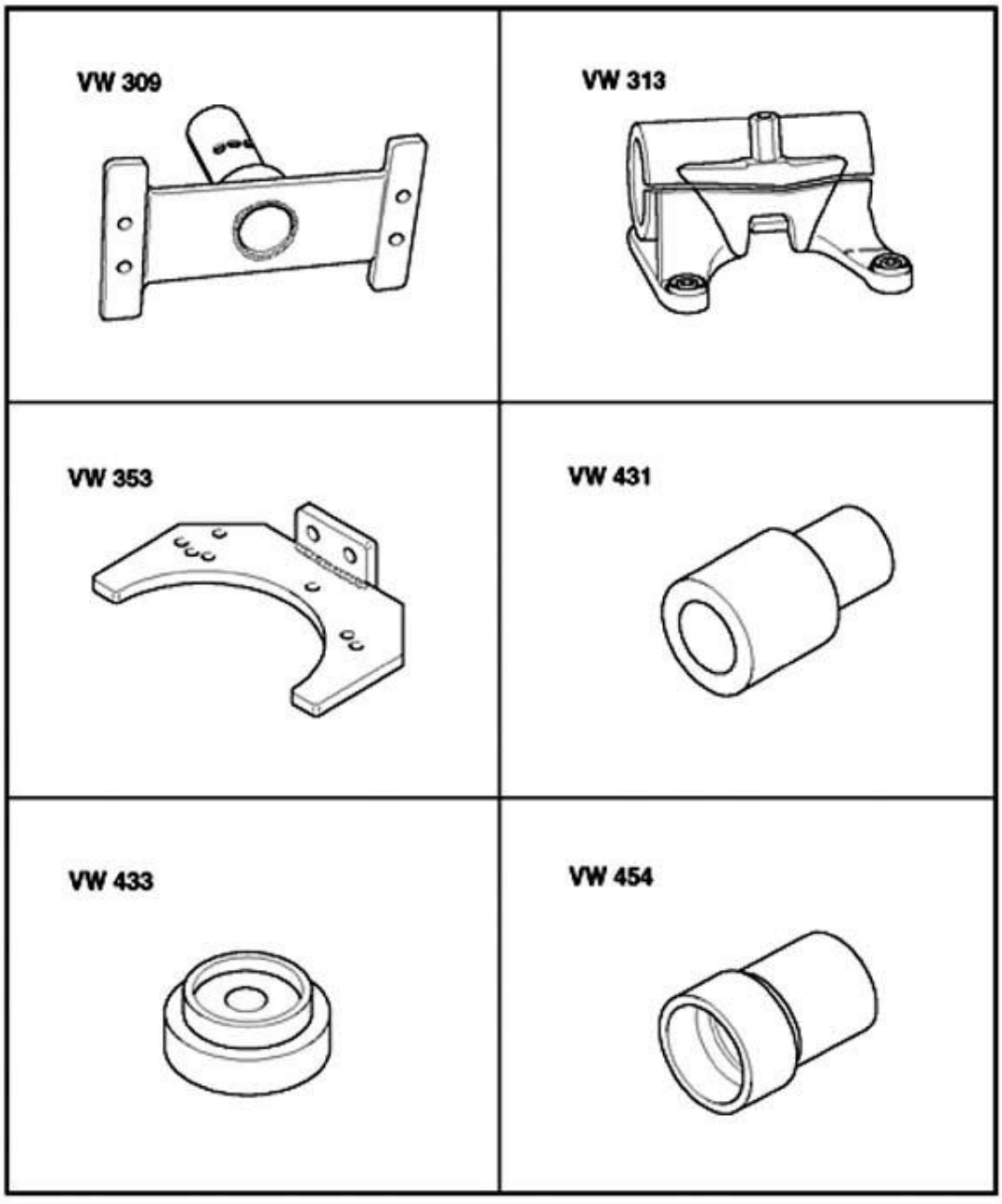


Fig. 84: Identifying Special Tools And Equipment (2 Of 4)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VW 512 Press disk
- VW 516 Tube
- VW 519 Tube
- VW 771 Multipurpose tool
- VW 801 Holding plate
- 40-105 Thrust plate

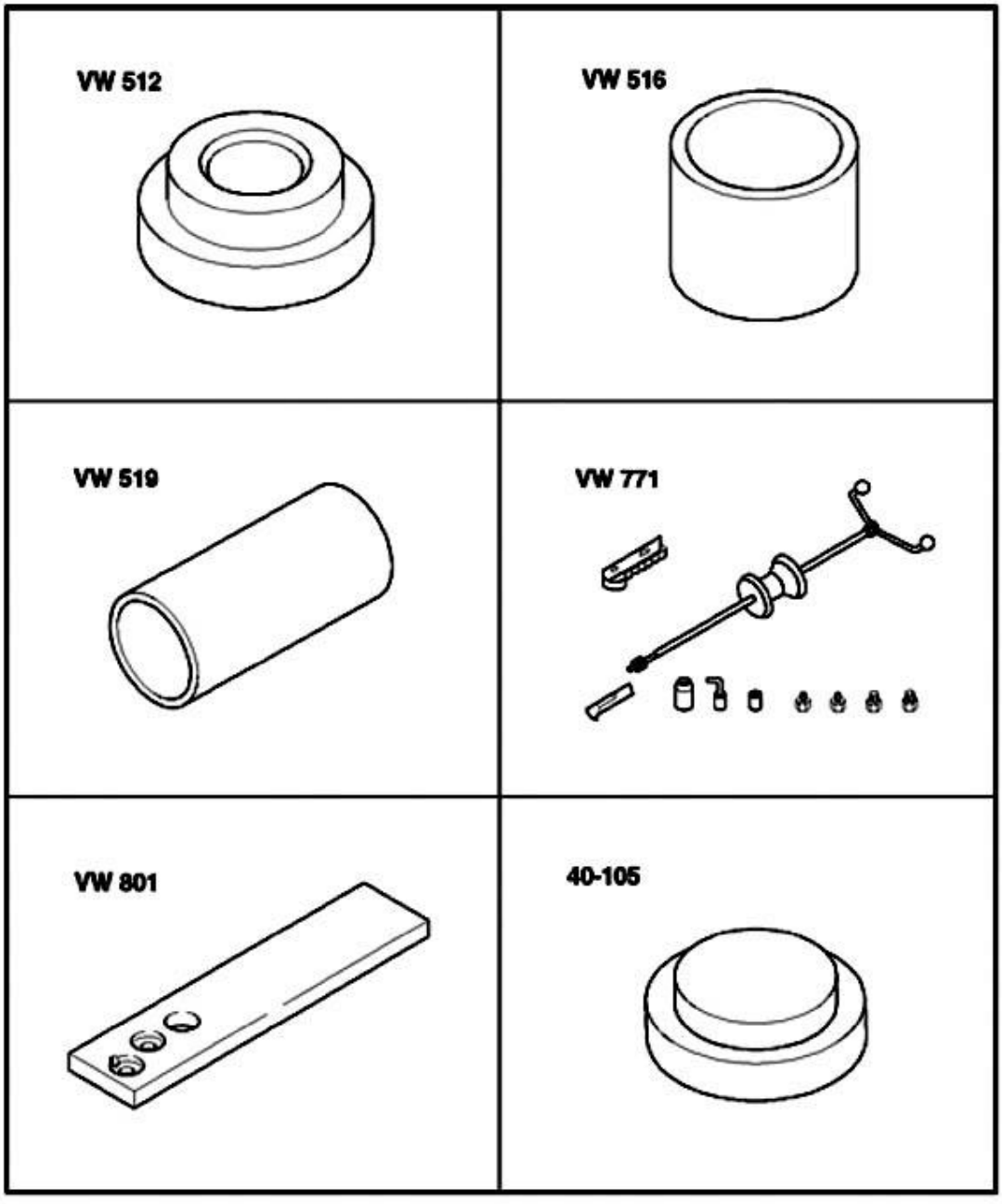


Fig. 85: Identifying Special Tools And Equipment (3 Of 4)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 40-20 Press tool
- 40-21 Press tool
- 2050 Thrust piece

- 3161 Extension
- 3235 Press
- V.A.G 1582 Tapered roller bearing puller

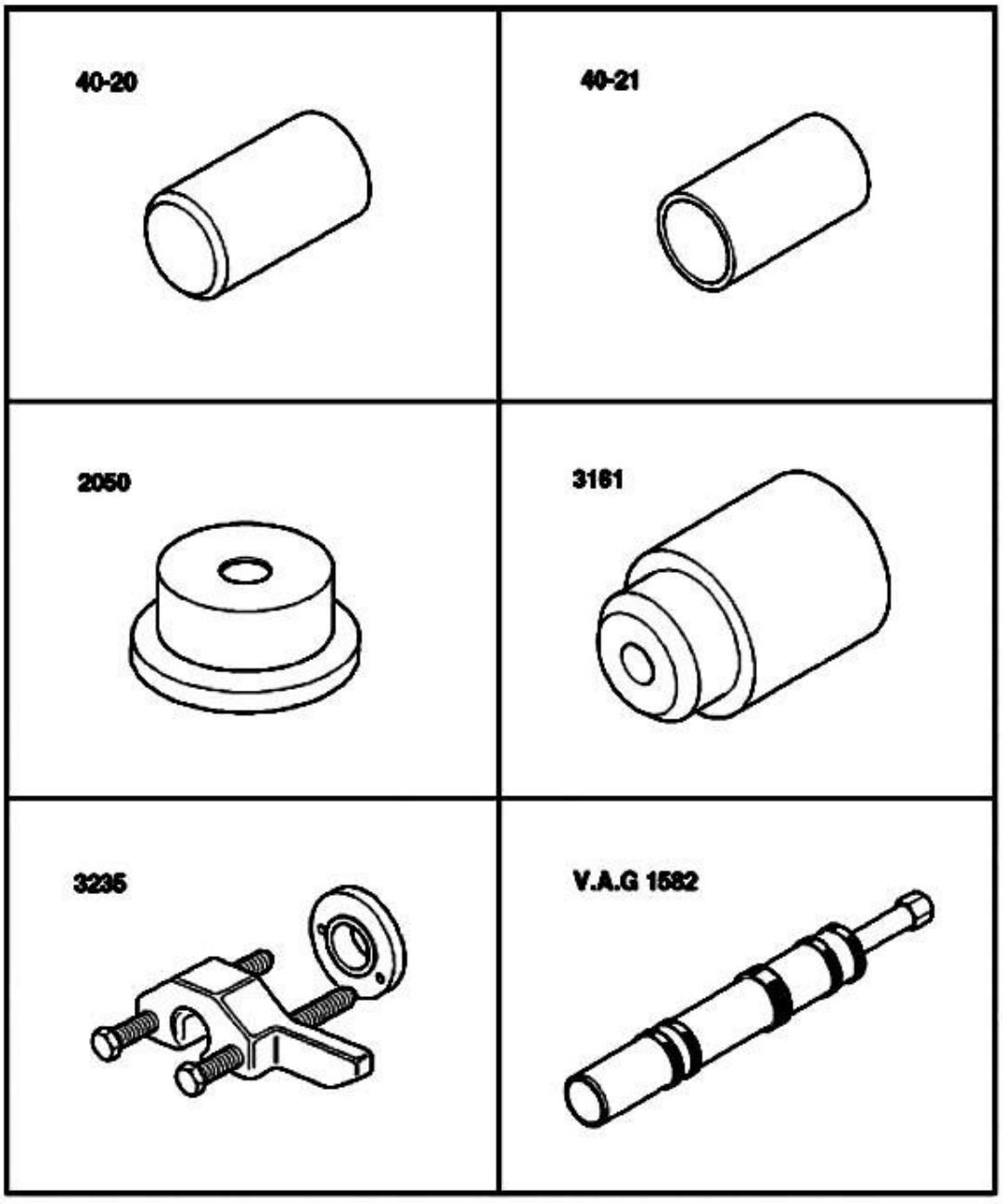


Fig. 86: Identifying Special Tools And Equipment (4 Of 4)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- V.A.G 1582/7 Grip

Fig. 87: Identifying V.A.G 1582/7 Grip
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 1 - Kukko 21/7 Internal puller
- 1 - Internal puller Kukko 21/8
- 2-Kukko 18/2 Puller
- 3 - Kukko 17/2 Separating device
- 4 - Kukko 22/2 Counter support

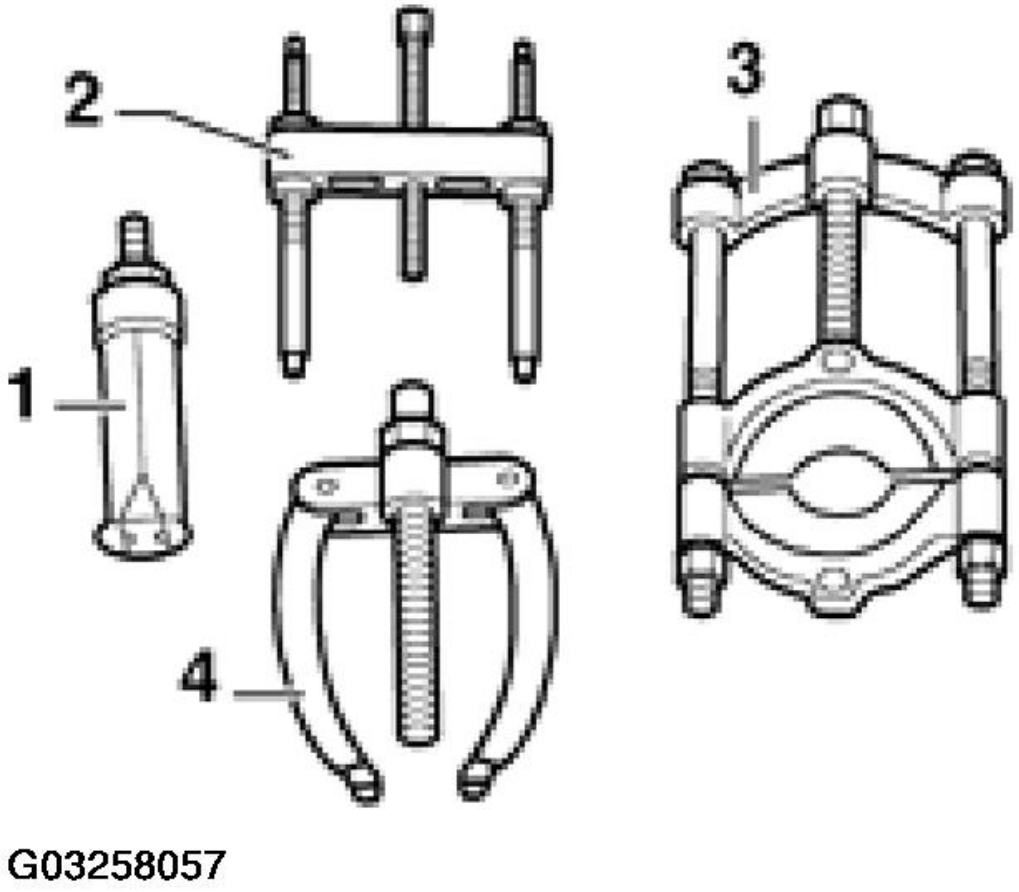


Fig. 88: Identifying Special tools - Puller
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE:

- **When installing new gears or a new output shaft consult technical data. See Code letters, application, ratios, capacities .**
- **If the output shaft or tapered roller bearings have been replaced then perform output shaft adjustment. See OUTPUT SHAFT FOR 1ST-4TH GEARS, ADJUSTING .**

NOTE: The following list refers to items in Fig. 89 .

1. **Clutch housing**
2. **Oil deflector ring**
3. **Dished washer**

- Pulling out. See **Pulling Dished Washer Out Of Output Shaft** .
- Pressing in. See **Pressing Dished Washer Into Output Shaft Onto Stop** .

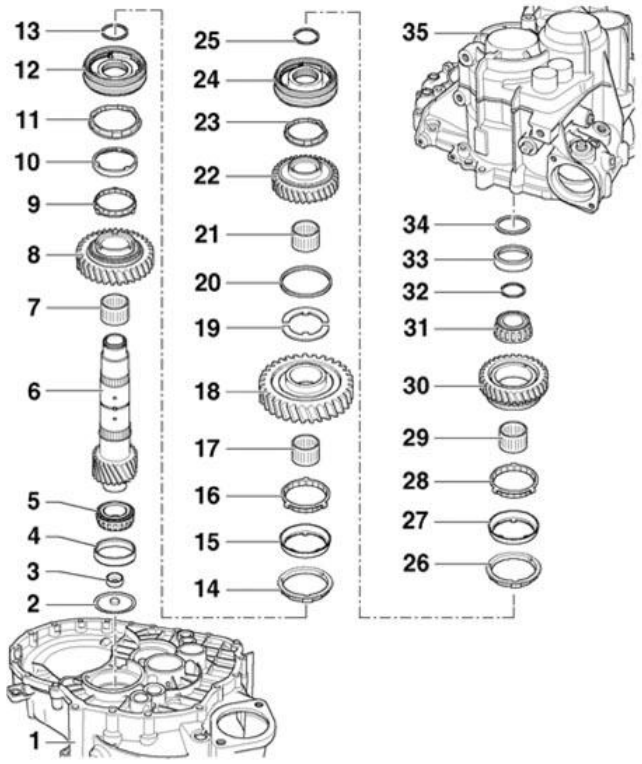
4. **Outer race/tapered roller bearing**
   - Pulling out. See **Pulling Tapered Roller Bearing Outer Race Out Of Transmission Housing** .
   - Pressing in. See **Pressing Tapered Roller Bearing Outer Race Into Transmission Housing** .
5. **Tapered roller bearing inner race**
   - Pressing off. See **Pulling Off Tapered Roller Bearing Inner Race** .
   - Pressing on. See **Pressing On Tapered Roller Bearing Inner Race** .
6. **Output shaft**
   - For 1st-4th gear
   - Adjusting. See **OUTPUT SHAFT FOR 1ST-4TH GEARS, ADJUSTING** .
7. **Needle roller bearing**
   - For 2nd gear
8. **2nd gear**
9. **Synchro-ring**
   - (Inner ring for 2nd gear)
   - Checking for wear. See **Checking Inner Ring For 1st, 2nd And 3 Gear For Wear** .
   - Check lugs for scoring
   - Installation position. See **Installation Position Of Outer Ring, Inner Ring And 2nd Gear Synchro Ring** .
10. **2nd gear outer ring**
    - Insert in the synchro-ring (item - 9 -)
    - Replace if scored
    - Installation position. See **Installation Position Of Outer Ring, Inner Ring And 2nd Gear Synchro Ring** .
11. **2nd gear synchro-ring**
    - Checking for wear. See **Checking 1st, 2nd And 3rd Gear Synchro-Rings For Wear** .
    - Installation position. See **Installation Position Of Outer Ring, Inner Ring And 2nd Gear Synchro Ring** .
12. **1st and 2nd gear locking collar with synchro-hub**
    - Pull off over bearing support after removing securing clip (item 13). See **Pressing Off 1st And 2nd Gear Locking Collar And Synchro-Hub** .
    - Disassembling. See **Disassembling And Assembling 1st And 2nd Gear Locking Collar And Synchro-Hub** .
    - Assembling locking collar/synchro hub. See **Disassembling And Assembling 1st And 2nd Gear Locking Collar And Synchro-Hub** and see **Assembling 1st And 2nd Gear Locking Collar/Synchro-Hub** .
    - Installation position. See **Installation Position Of 1st And 2nd gear Locking Collar/Synchro-Hub** .

- Pressing on **Pressing On 1st and 2nd Gear Locking Collar/Synchro-Hub** .

13. **Securing clip**
14. **1st gear synchro-ring**
    - Checking for wear. See **Checking 1st, 2nd And 3rd Gear Synchro-Rings For Wear** .
    - Assemble so that recesses locate in locking collar (item-12-) locking pieces
15. **1st gear outer ring**
    - Insert in the synchro-ring (item -11 -), installation position. See **Installation Position For 1st or 3rd Gear Outer Ring** .
    - Replace if scored
16. **Synchro-ring**
    - (1st gear inner ring)
    - Checking for wear. See **Checking Inner Ring For 1st, 2nd And 3 Gear For Wear** .
    - Check lugs for scoring
    - Installation position. See **Installation Position Synchro-Ring (Inner Ring)** .
17. **Needle roller bearing**
    - For 1st gear
18. **1st selector gear**
    - Installation position. See **Identifying Installation Position 1st And 3rd Gear Wheel** .
19. **Thrust washer**
    - For 1st and 4th gear
    - Insert lugs on thrust washer in holes on output shaft
20. **Shim**
    - Holds thrust washer (-item 19-) in position on output shaft
21. **Needle roller bearing**
    - For 4th gear
22. **Selector gear for 4th gear**
23. **4th gear synchro-ring**
    - Checking for wear. See **Checking Synchro-Ring For Wear** .
24. **Locking collar with 3rd and 4th gear synchro-hub**
    - Pull off by pulling off 4th gear wheel after removing the circlip (item - 25 -). See **Pulling Off 3rd And 4th Gear Synchro-Hub/Locking Collar Over 4th Gear Wheel** .
    - Disassembling. See **Disassembling And Assembling 1st And 2nd Gear Locking Collar And Synchro-Hub** .
    - Installation position locking collar/synchro-hub. See **Identifying Installation Position 3rd And 4th Gear Locking Collar/Synchro-Hub** .
    - Assembling locking collar/synchro hub. See **Disassembling And Assembling 1st And 2nd Gear Locking Collar And Synchro-Hub** and see **Assembling 1st And 2nd Gear Locking Collar/Synchro-Hub** .

- **Pressing On 3rd And 4th Gear Synchro-Hub With Locking Collar**

25. **Securing clip**
26. **3rd gear synchro-ring**
    - Checking for wear. See **Checking 1st, 2nd And 3rd Gear Synchro-Rings For Wear** .
27. **Outer ring for 3rd gear**
    - Insert in the synchro-ring (item - 26 -), installation position. See **Installation Position For 1st or 3rd Gear Outer Ring** .
    - Replace if scored
28. **Synchro-ring**
    - (3rd gear inner ring)
    - Checking for wear. See **Checking Inner Ring For 1st, 2nd And 3 Gear For Wear** .
    - Check lugs for scoring
    - Installation position. See **Installation Position Synchro-Ring (Inner Ring)** .
29. **Needle roller bearing**
    - For 3rd gear
30. **Selector gear for 3rd gear**
    - Installation position. See **Identifying Installation Position 1st And 3rd Gear Wheel** .
31. **Tapered roller bearing inner race**
    - Pulling off. See **Pulling Off Tapered Roller Bearing Inner Race** .
    - Pressing on **Pressing On Tapered Roller Bearing Inner Race** .
32. **Securing clip**
    - Redetermine thickness if tapered roller bearing (-item 6 -) or output shaft (-item 31 -) are replaced. See **Determining Thickness Of Circlip** .
33. **Outer race/tapered roller bearing**
    - Pulling out. See **Pulling Tapered Roller Bearing Outer Race Out From Transmission Housing** .
    - Pressing in. See **Pressing Tapered Roller Bearing Outer Race Into Transmission Housing** .
34. **Shim**
    - Determining thickness. See **OUTPUT SHAFT FOR 1ST-4TH GEARS, ADJUSTING** .
35. **Transmission housing**



1 - Clutch housing
2 - Oil deflector ring
3 - Dished washer
4 - Outer race/tapered roller bearing
5 - Tapered roller bearing inner race
6 - Output shaft
7 - Needle roller bearing
8 - 2nd gear
9 - Synchro-ring
10 - 2nd gear outer ring
11 - 2nd gear synchro-ring
12 - 1st and 2nd gear locking collar with synchro-hub
13 - Securing clip
14 - 1st gear synchro-ring
15 - 1st gear outer ring
16 - Synchro-ring
17 - Needle roller bearing
18 - 1st selector gear
19 - Thrust washer
20 - Shim
21 - Needle roller bearing
22 - Selector gear for 4th gear
23 - 4th gear synchro-ring
24 - Locking collar with 3rd and 4th gear synchro-hub
25 - Securing clip
26 - 3rd gear synchro-ring
27 - Outer ring for 3rd gear
28 - Synchro-ring
29 - Needle roller bearing
30 - Selector gear for 3rd gear
31 - Tapered roller bearing inner race
32 - Securing clip
33 - Outer race/tapered roller bearing
34 - Shim
35 - Transmission housing

G03258058

Fig. 89: Disassembling And Assembling Output Shaft, 1st-4th Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling Dished Washer Out Of Output Shaft

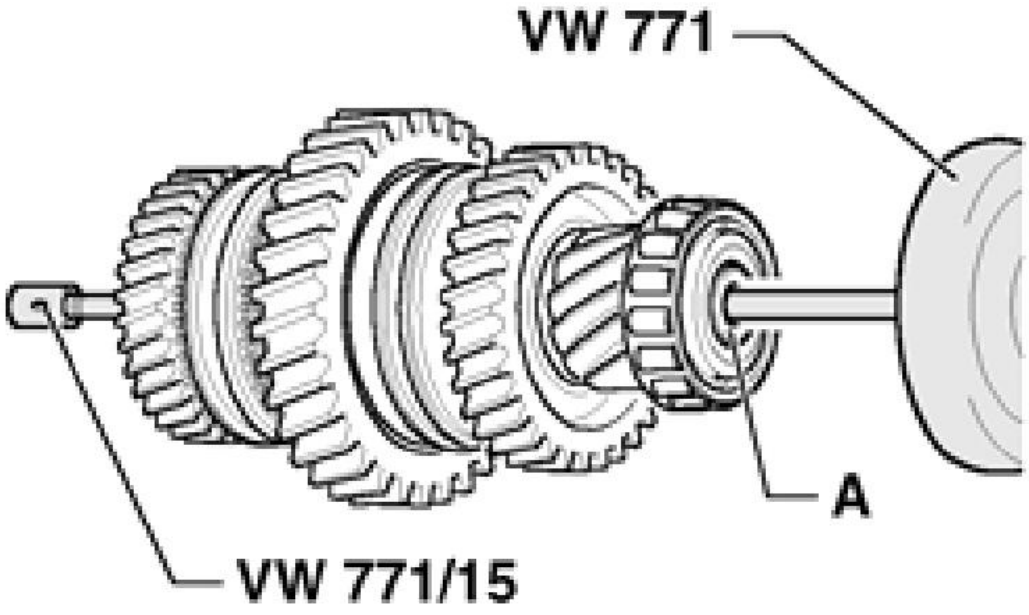


Fig. 90: Pulling Dished Washer -A- Out Of Output Shaft
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing Dished Washer Into Output Shaft Onto Stop

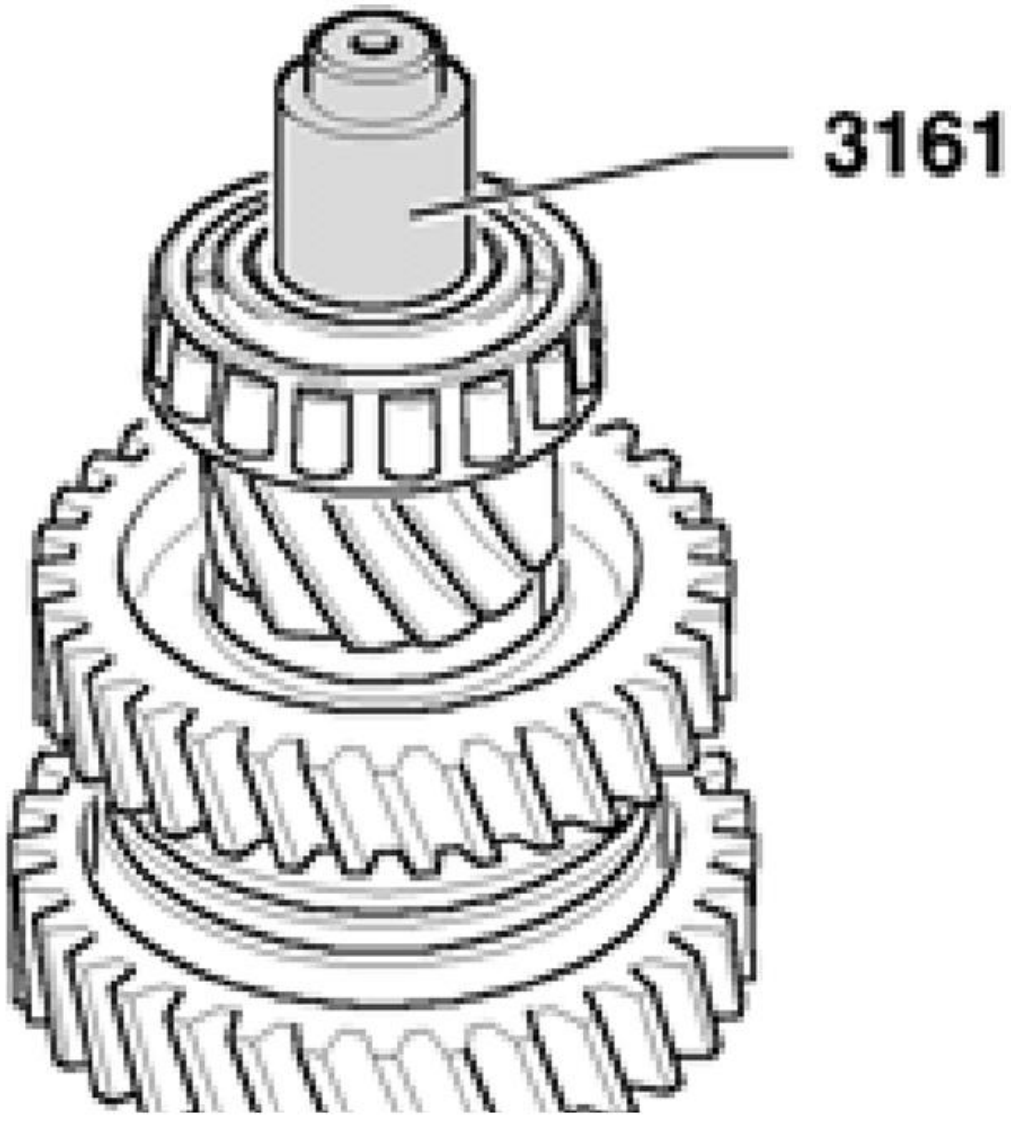


Fig. 91: Pressing Dished Washer -A- Into Output Shaft Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling Tapered Roller Bearing Outer Race Out Of Transmission Housing

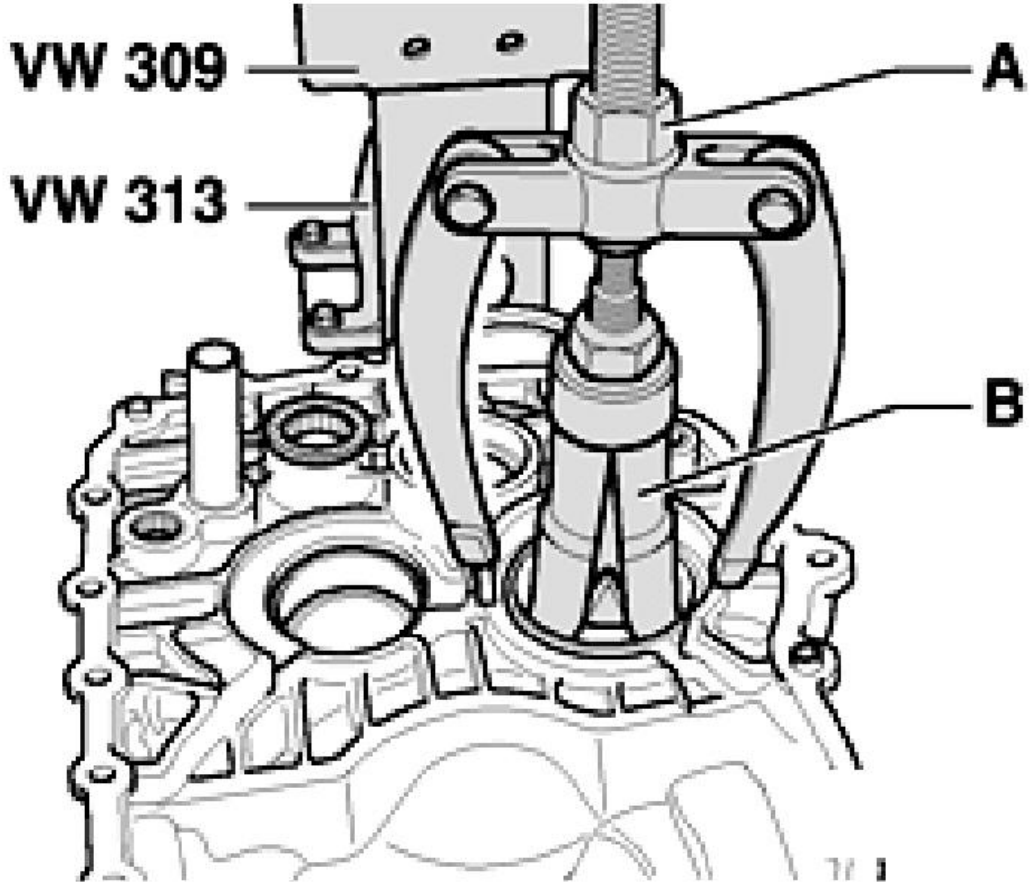


Fig. 92: Pulling Tapered Roller Bearing Outer Race Out Of Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Counter support, e.g. Kukko 22/2
B. Internal puller 56 to 70 mm, e.g. Kukko 21/8

Pressing Tapered Roller Bearing Outer Race Into Transmission Housing

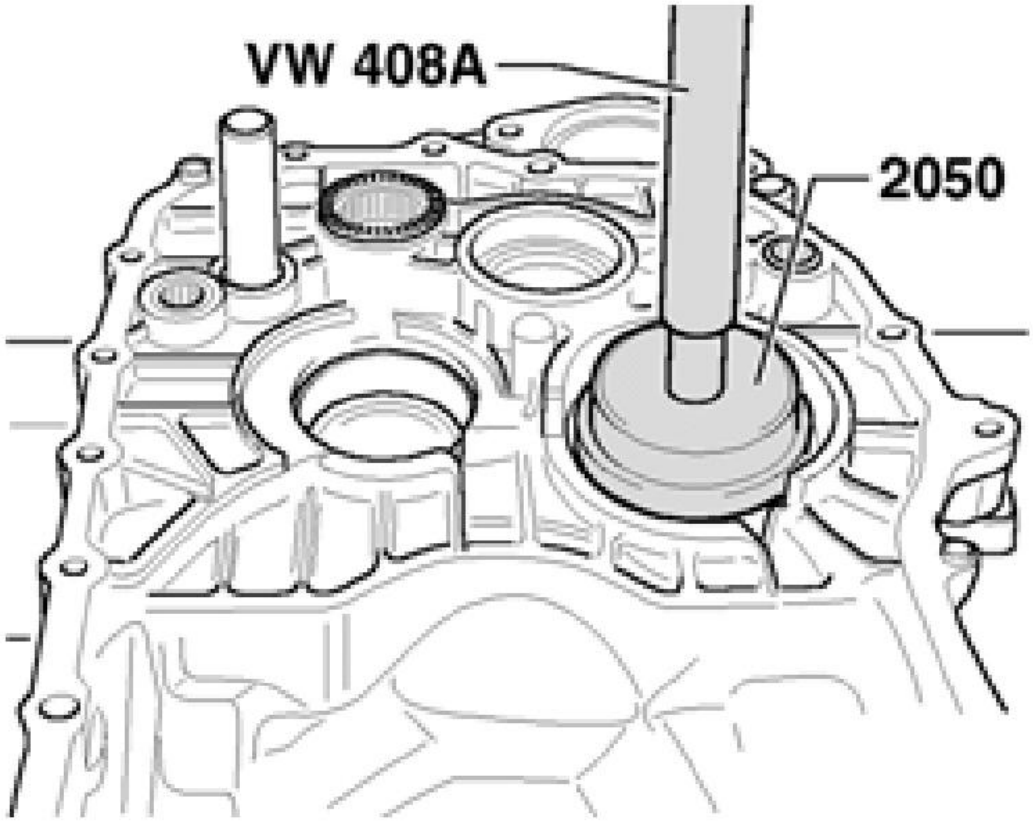


Fig. 93: Pressing Tapered Roller Bearing Outer Race Into Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Support transmission housing with press tool 40-20 directly below bearing mounting.

Pulling Off Tapered Roller Bearing Inner Race

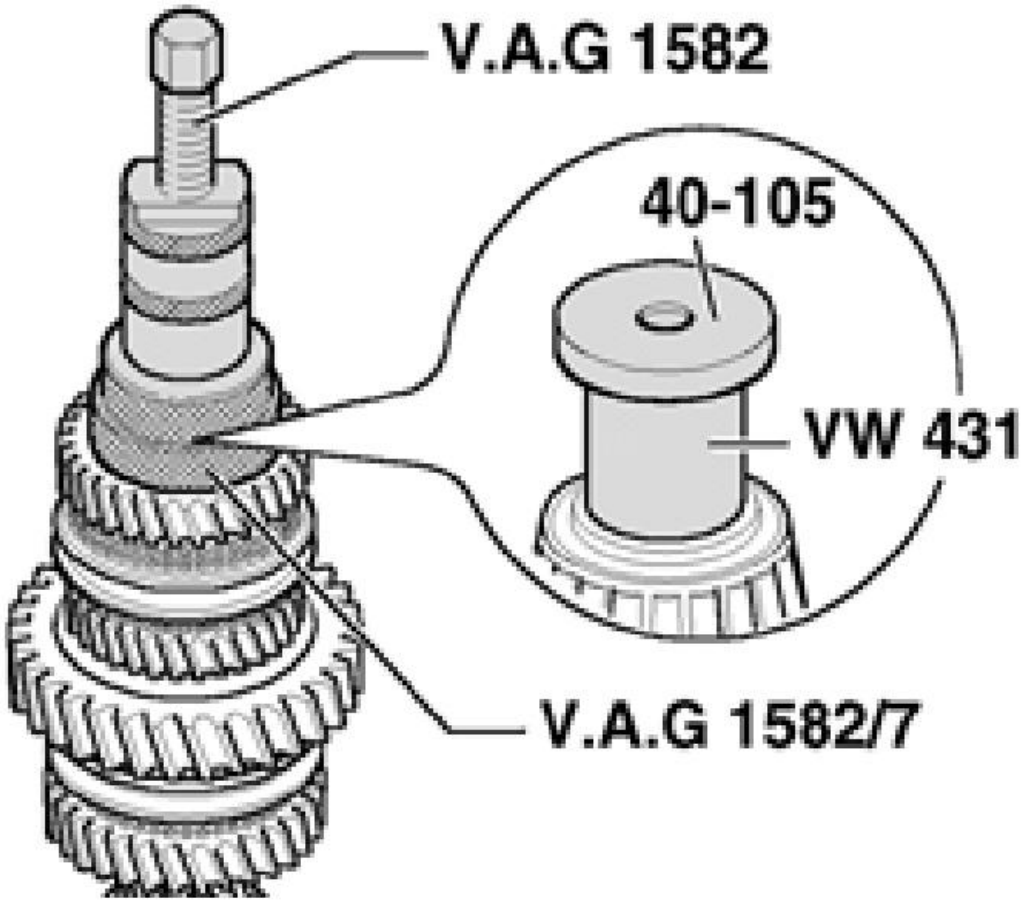


Fig. 94: Pulling Off Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Before mounting puller, position press piece VW 431 in output shaft and set thrust plate 40-105 on it.

Pulling Off 3rd And 4th Gear Synchro-Hub/Locking Collar Over 4th Gear Wheel

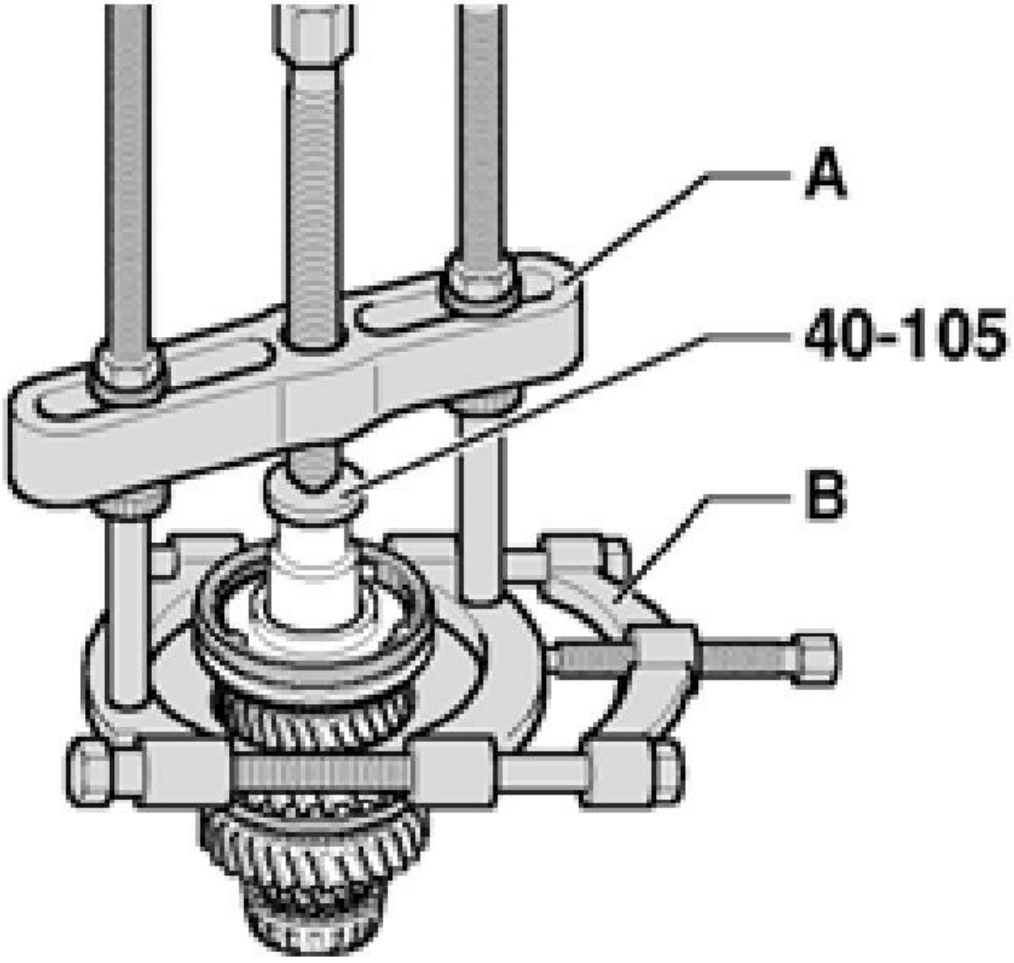


Fig. 95: Pulling Off 3rd And 4th Gear Synchro-Hub/Locking Collar Over 4th Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- First remove securing clip.

A. Puller, e.g. Kukko 18/2
B. Separating device 22 to 115 mm, e.g. Kukko 17/2

Pressing Off 1st And 2nd Gear Locking Collar And Synchro-Hub

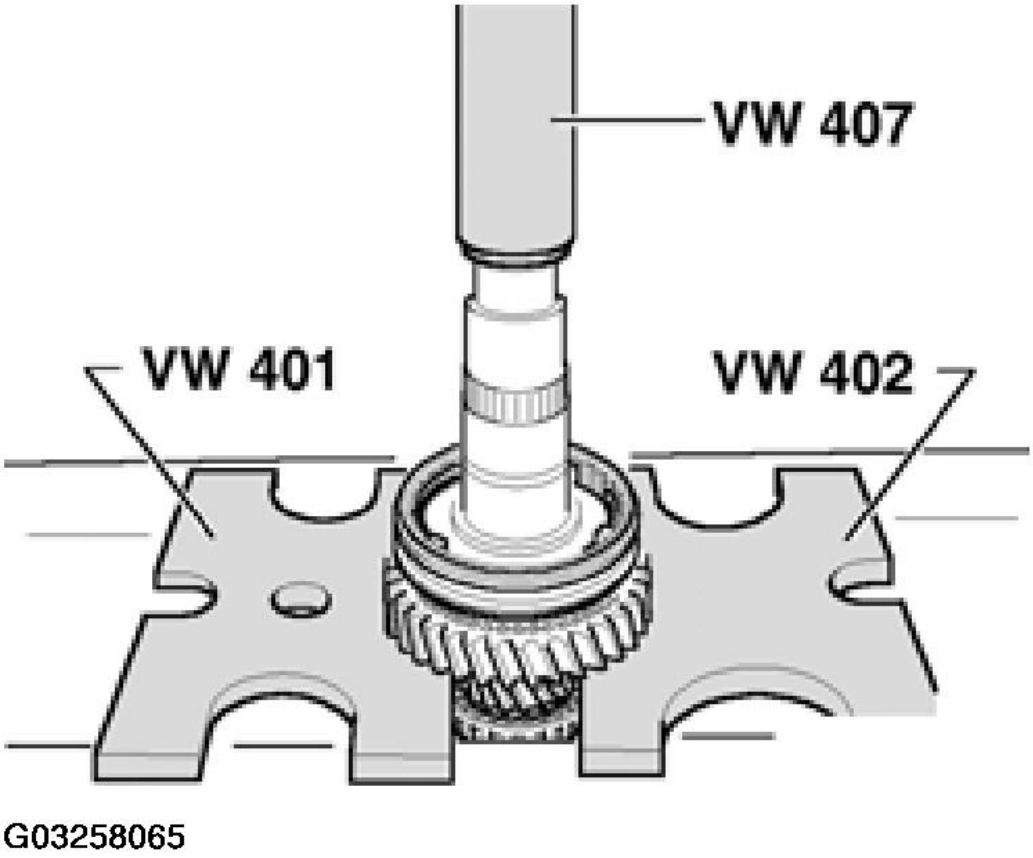


Fig. 96: Pressing Off 1st And 2nd Gear Locking Collar And Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- After removing securing ring press 2nd selector gear and locking collar/synchro-hub off together.

Pulling Off Tapered Roller Bearing Inner Race

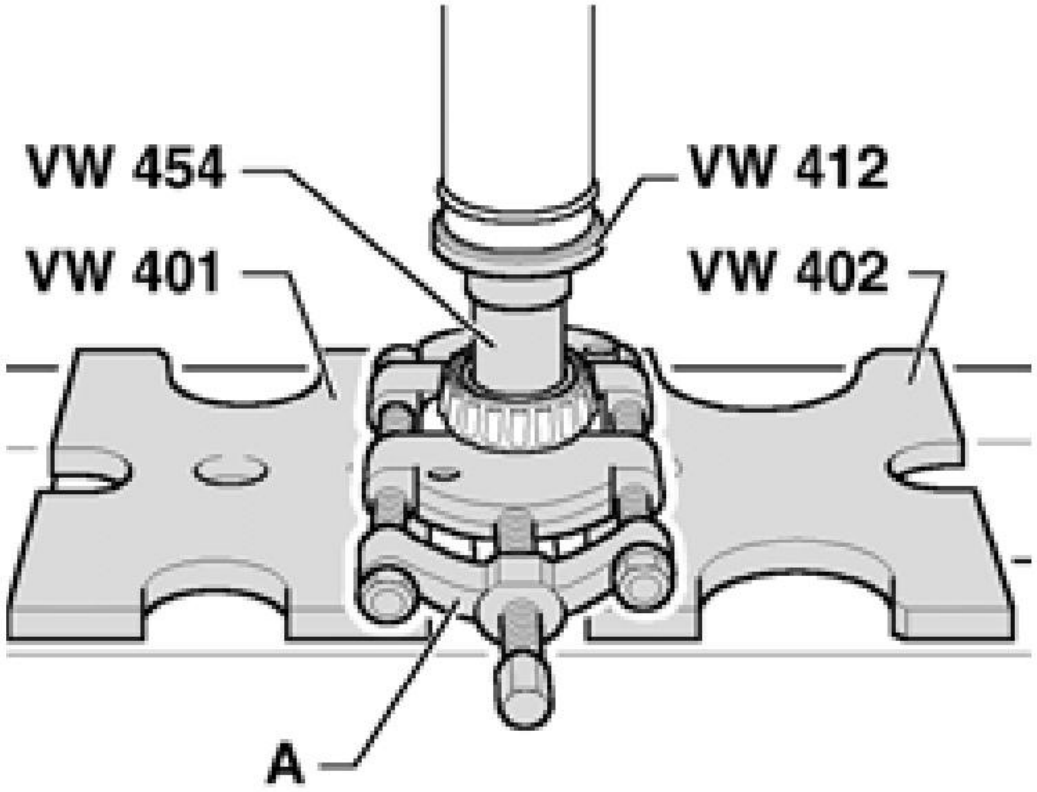


Fig. 97: Pulling Off Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Separating device 22 to 115 mm, e.g. Kukko 17/2

Pressing On Tapered Roller Bearing Inner Race

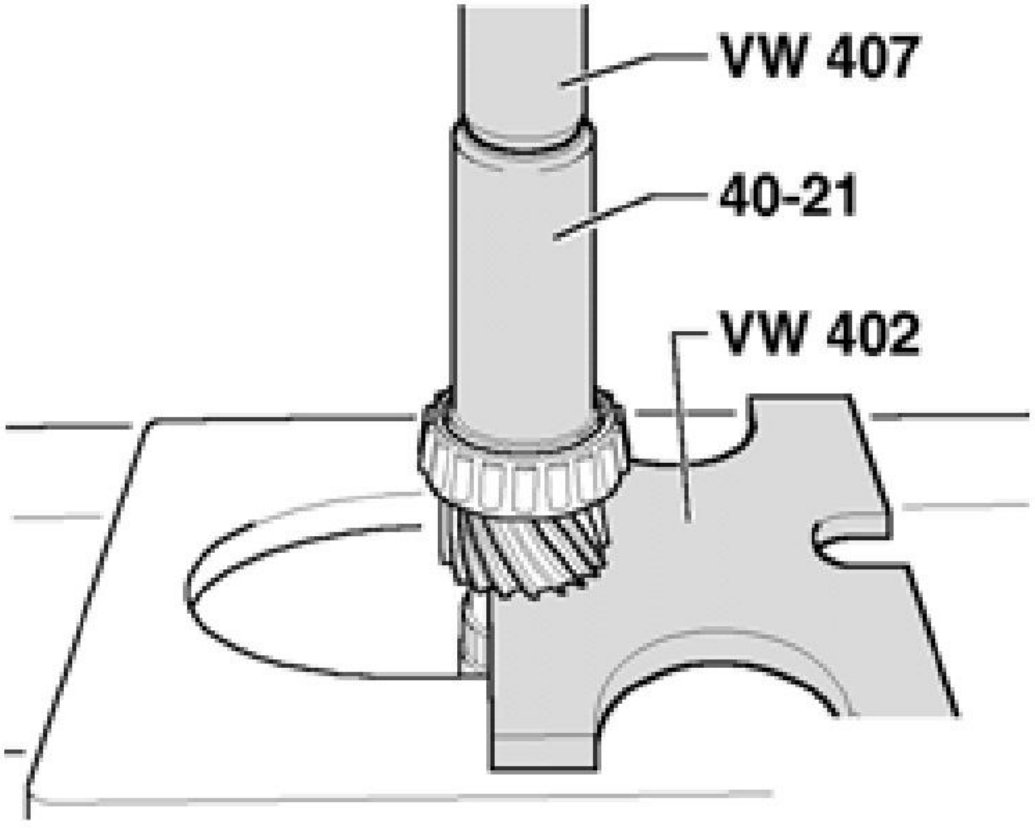


Fig. 98: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Checking Inner Ring For 1st, 2nd And 3 Gear For Wear

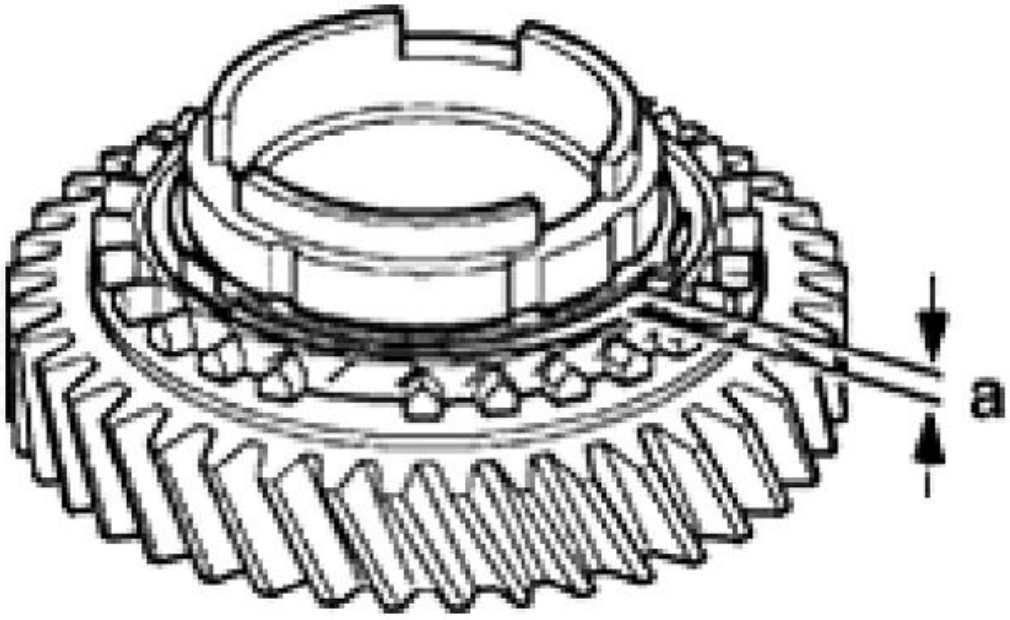


Fig. 99: Checking Inner Ring For 1st, 2nd And 3 Gear For Wear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press inner ring onto gear wheel cone and measure gap "a" with a feeler gauge.

WEAR LIMIT (INNER RING FOR 1ST, 2ND AND 3 GEAR)

Gap "a"	New dimension	Wear limit
1st, 2nd and 3rd gear	0.75 ... 1.25 mm	0.3 mm

Checking 1st, 2nd And 3rd Gear Synchro-Rings For Wear

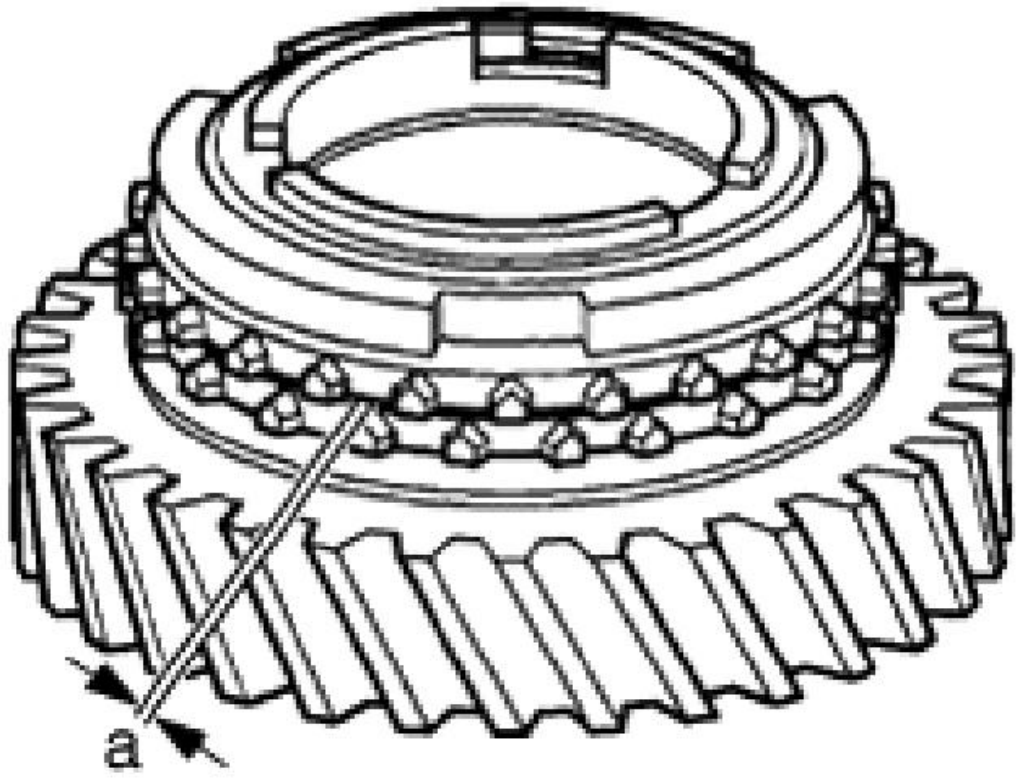


Fig. 100: Checking 1st, 2nd And 3rd Gear Synchro-Rings For Wear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press synchro-ring, outer-ring and inner-ring onto selector gear cone and measure gap "a" with feeler gauge.

WEAR LIMIT (1ST, 2ND AND 3RD GEAR SYNCHRO-RINGS)

Gap "a"	New dimension	Wear limit
1st, 2nd and 3rd gear	1.2 ... 1.8 mm	0.5 mm

Installation Position Of Outer Ring, Inner Ring And 2nd Gear Synchro Ring

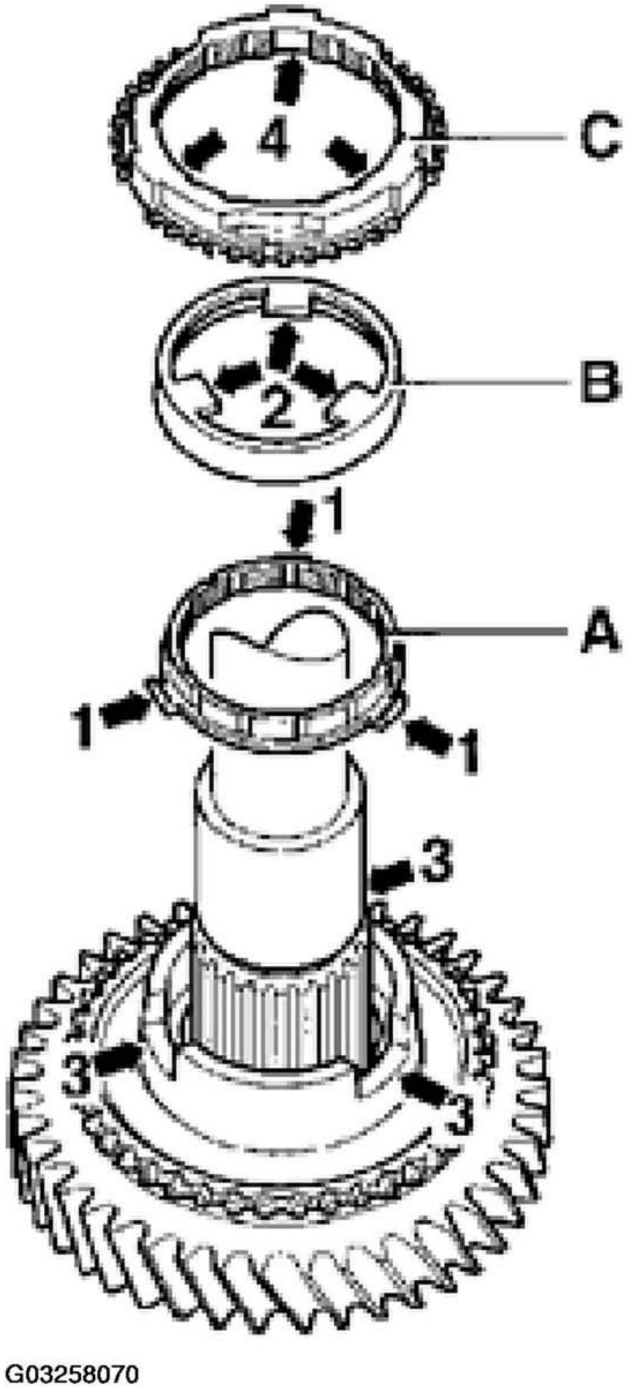


Fig. 101: Identifying Installation Position Of Outer Ring, Inner Ring And 2nd Gear Synchro Ring
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Place inner ring -A- on 2nd gear wheel.

Angled lugs (arrow -1-) point toward outer ring -B-.

- Fit outer ring -B-.

  Lugs (arrow -2-) engage in gear wheel recesses (arrow 3).

- Fit synchro-ring -C-.

  The recesses (arrow -4-) engage in lugs (arrow -1-) of inner ring -A-.

Disassembling And Assembling 1st And 2nd Gear Locking Collar And Synchro-Hub

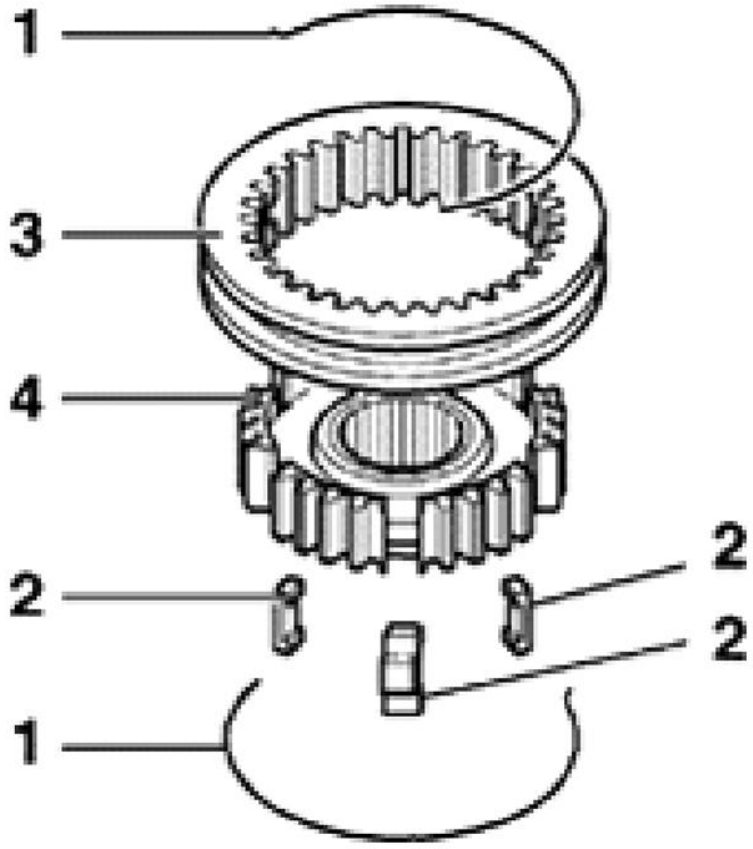


Fig. 102: Disassembling And Assembling 1st And 2nd Gear Locking Collar And Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

1. Spring

2. Locking piece
3. Locking collar
4. Synchro-hub

- Slide locking collar over synchro-hub.

The recesses for locking pieces in synchro-hub and locking collar must align.

Assembling 1st And 2nd Gear Locking Collar/Synchro-Hub

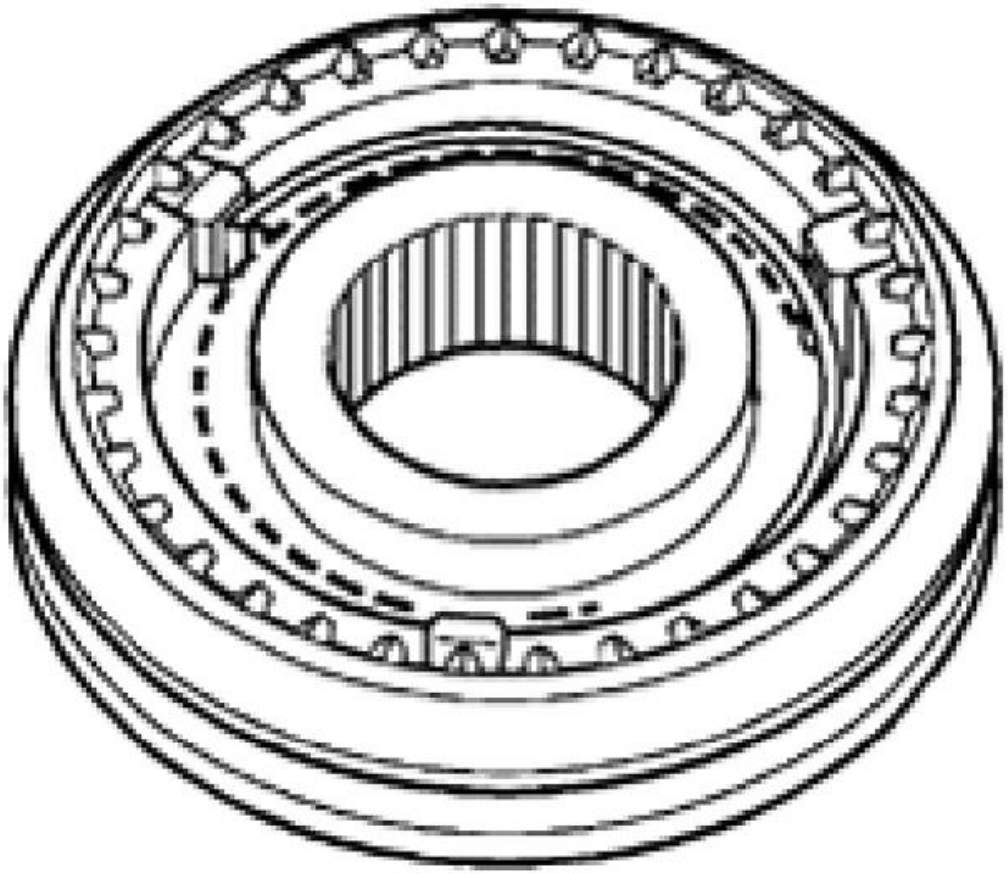


Fig. 103: Assembling 1st And 2nd Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The locking collar has been pushed over the synchro-hub.

- Insert locking pieces and install springs 120° offset. Angled end of spring must locate in hollow locking piece.

Installation Position Of 1st And 2nd gear Locking Collar/Synchro-Hub

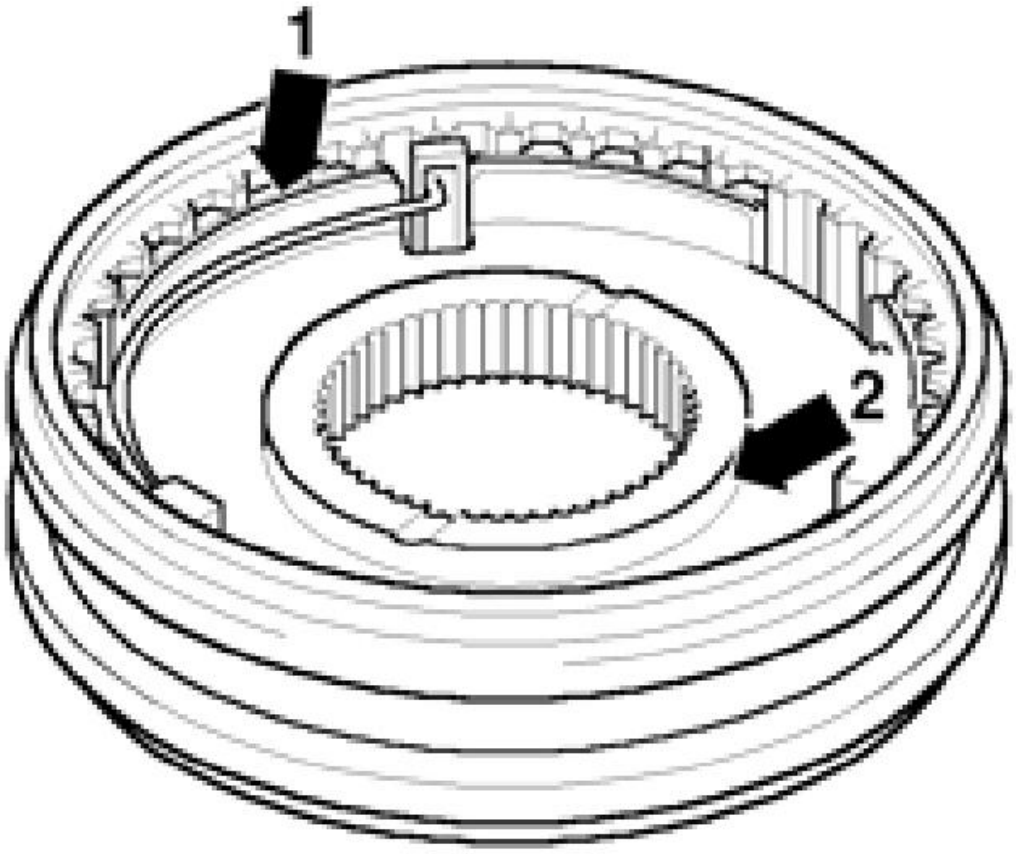


Fig. 104: Identifying Installation Position Of 1st And 2nd Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Identification groove (arrow -1-) and narrow collar (arrow -2-) of synchro-hub point toward 1st gear.

Pressing On 1st and 2nd Gear Locking Collar/Synchro-Hub

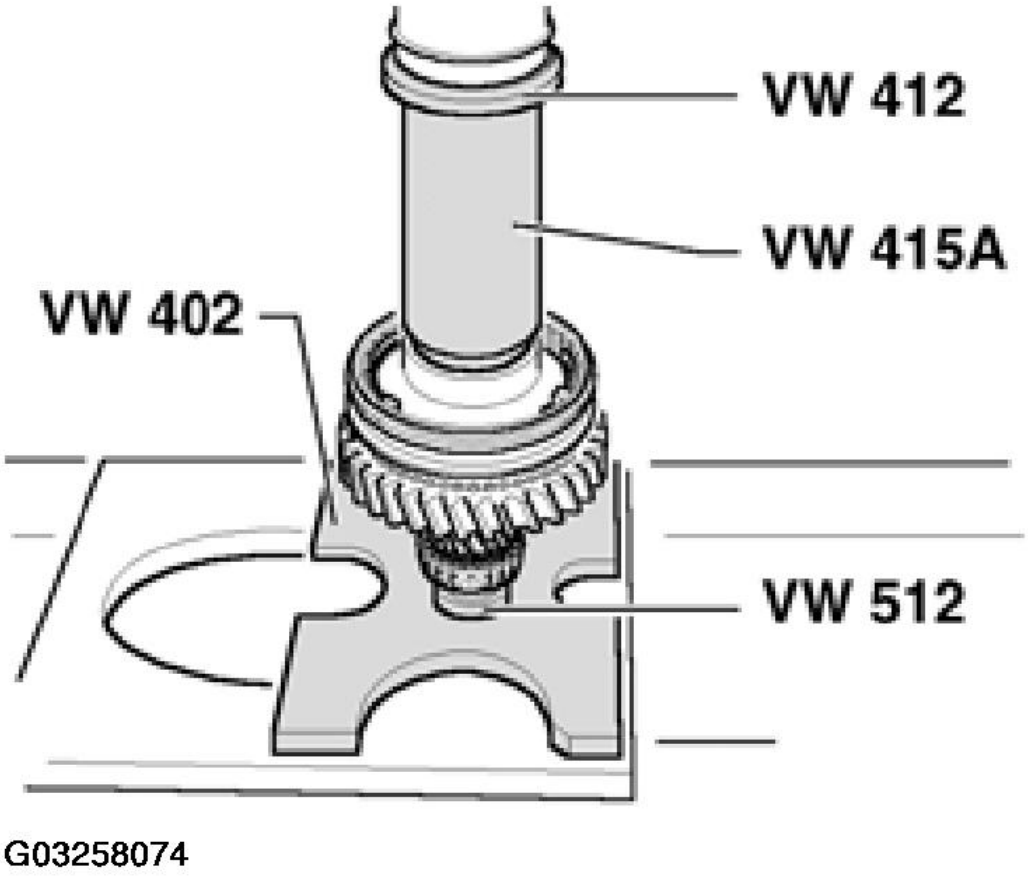


Fig. 105: Pressing On 1st And 2nd Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Installation Position For 1st or 3rd Gear Outer Ring

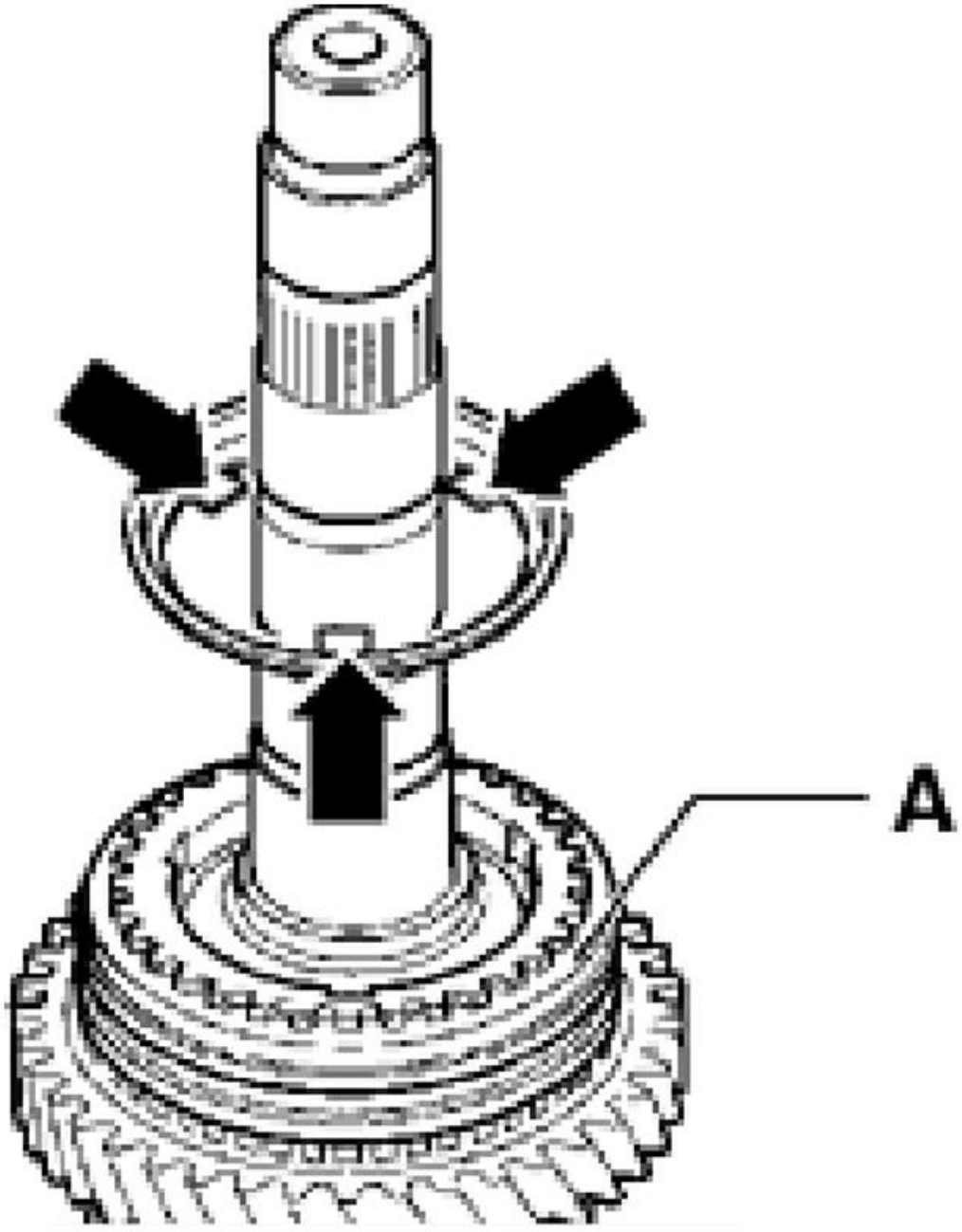


Fig. 106: Identifying Installation Position For 1st Or 3rd Gear Outer Ring
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Lugs (arrows) face toward synchro-hub/locking collar -A-

Installation Position Synchro-Ring (Inner Ring)

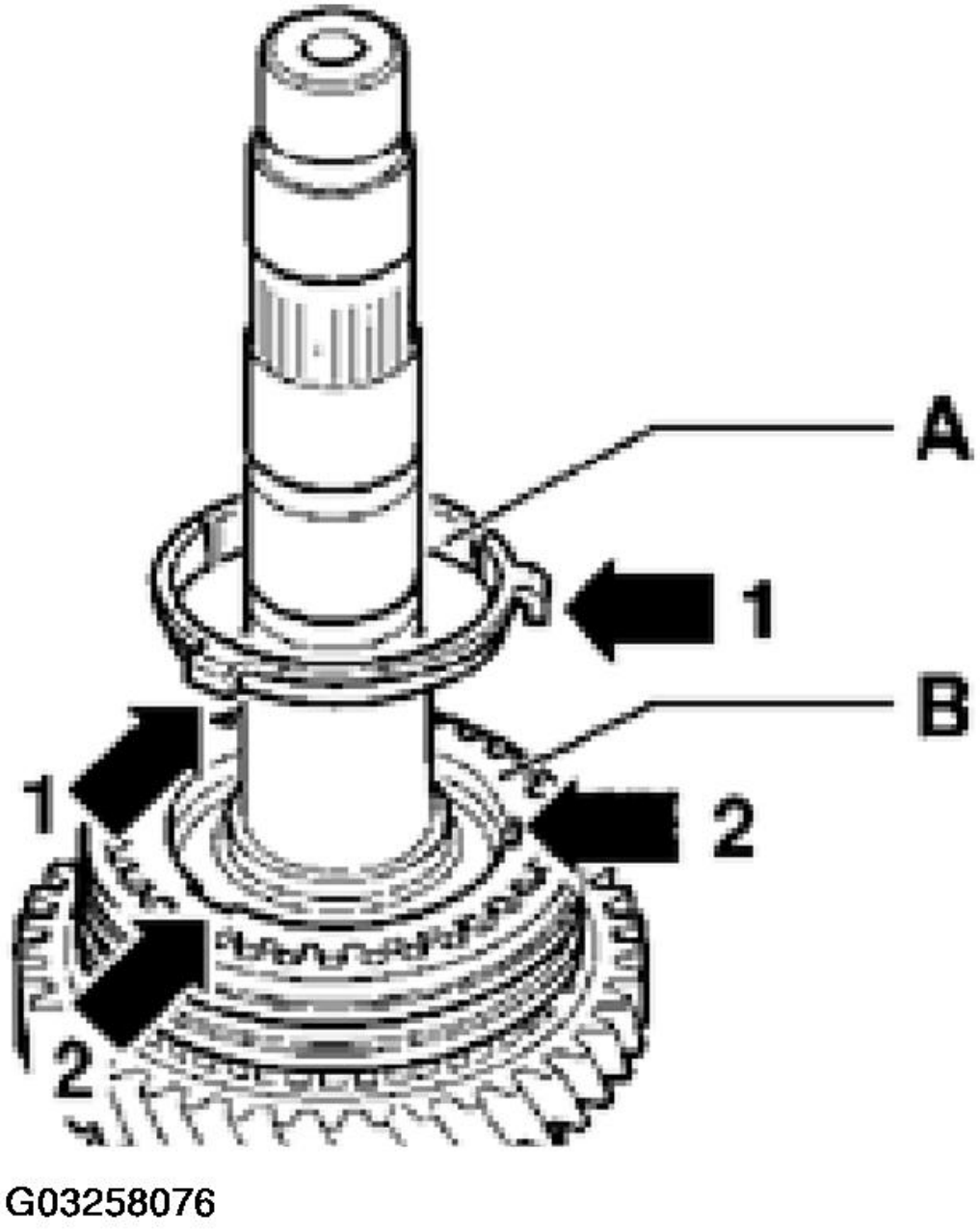
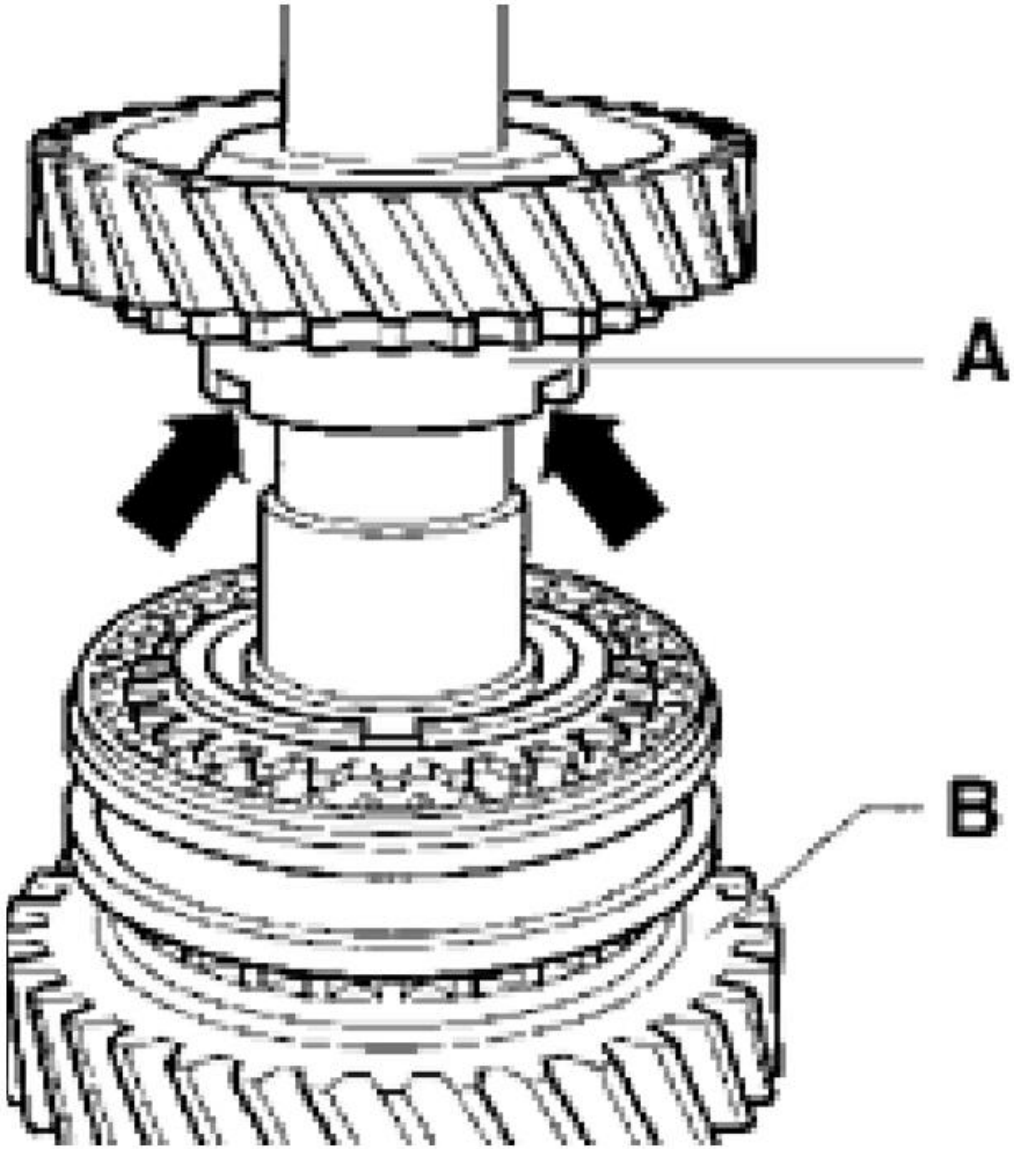


Fig. 107: Identifying Installation Position Synchro-Ring (Inner Ring) -A-

Courtesy of VOLKSWAGEN OF AMERICA, INC.

The lugs (arrows -1-) engage in the recesses (arrow 2) in the synchro-ring -B-.

Identifying Installation Position 1st And 3rd Gear Wheel



G03258077

Fig. 108: Identifying Installation Position 1st And 3rd Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The higher shoulder -A- faces toward 2nd or 4th gear -B-. The recesses in the shoulder (arrows) engage in the lugs of the outer ring (arrow. See **Fig. 106**)

Identifying Installation Position 3rd And 4th Gear Locking Collar/Synchro-Hub

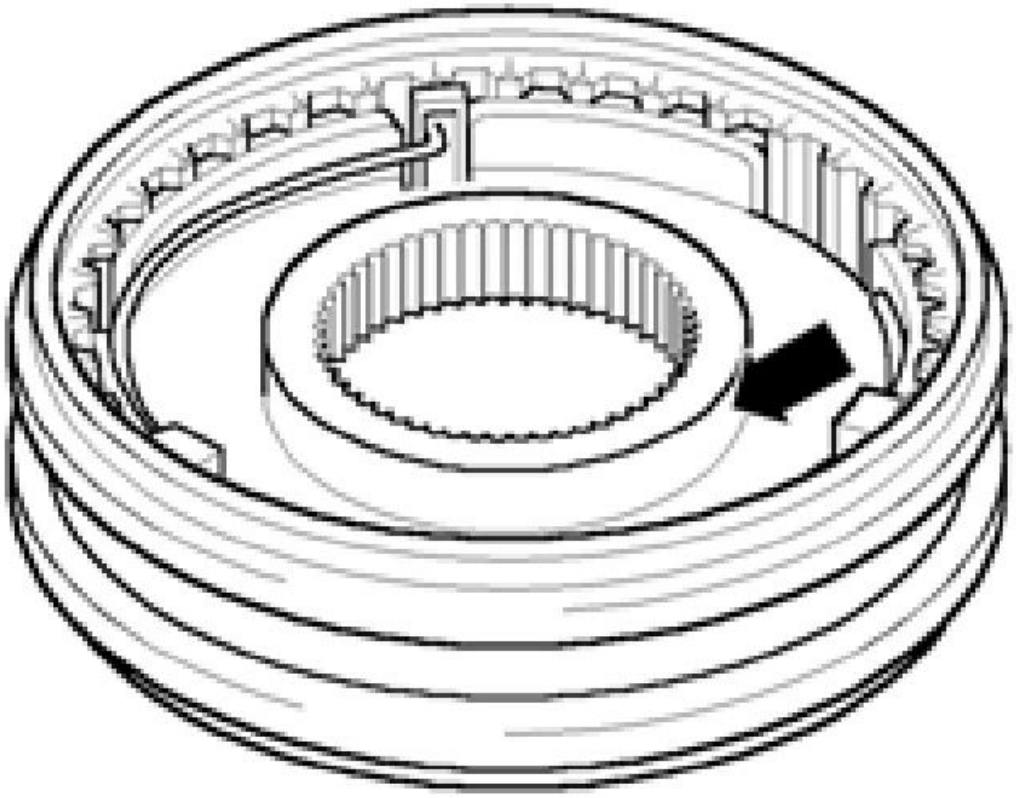


Fig. 109: Identifying Installation Position 3rd And 4th Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The wider shoulder of the synchro-hub (arrow) faces toward 3rd gear.

Pressing On 3rd And 4th Gear Synchro-Hub With Locking Collar

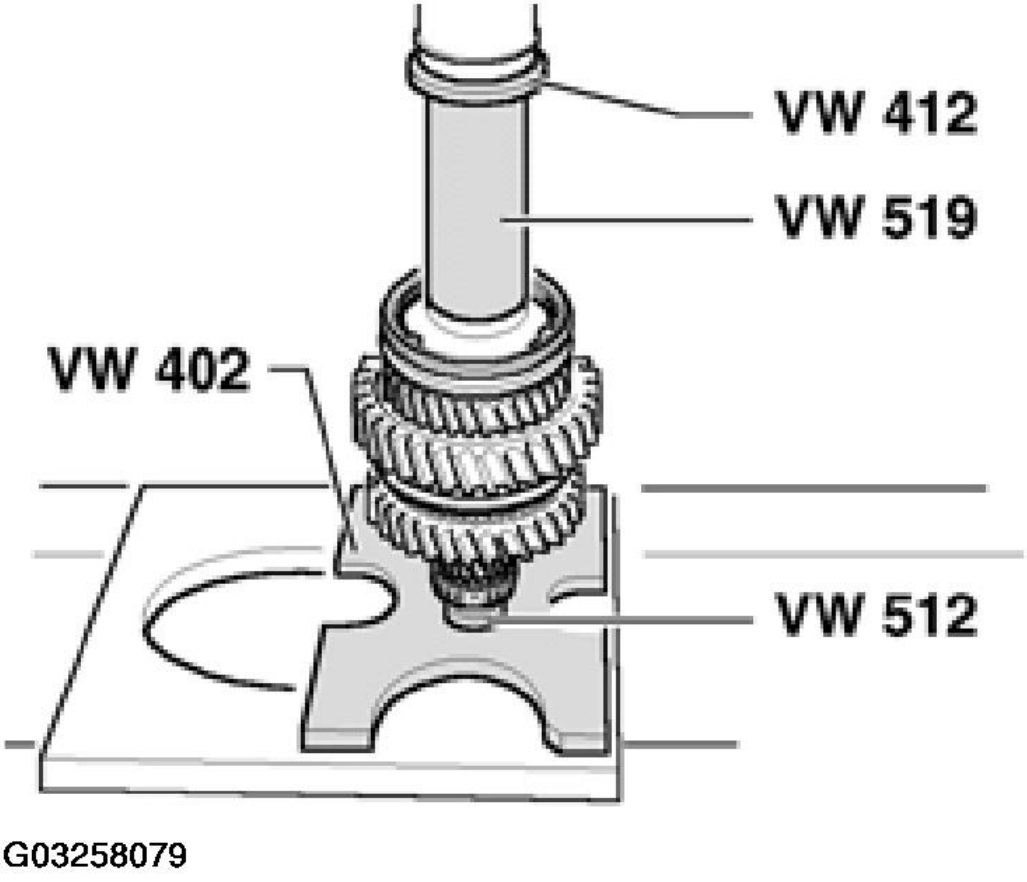


Fig. 110: Pressing On 3rd And 4th Gear Synchro-Hub With Locking Collar
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Checking Synchro-Ring For Wear

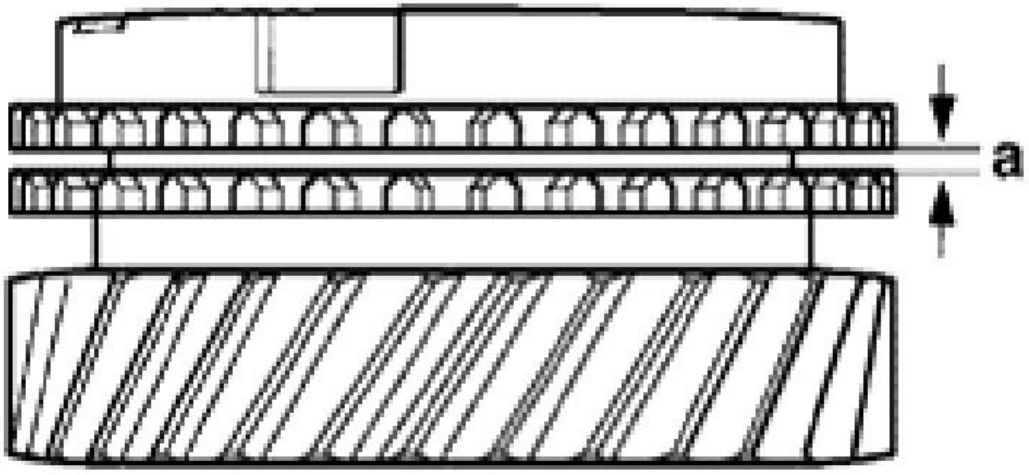


Fig. 111: Checking Synchro-Ring For Wear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press synchro-ring onto gear cone and measure gap "a" with feeler gauge.

WEAR LIMIT (SYNCHRO-RING)

Gap "a"	New dimension	Wear limit
4th gear	1.0 ... 1.7 mm	0.5 mm

Pressing On Tapered Roller Bearing Inner Race

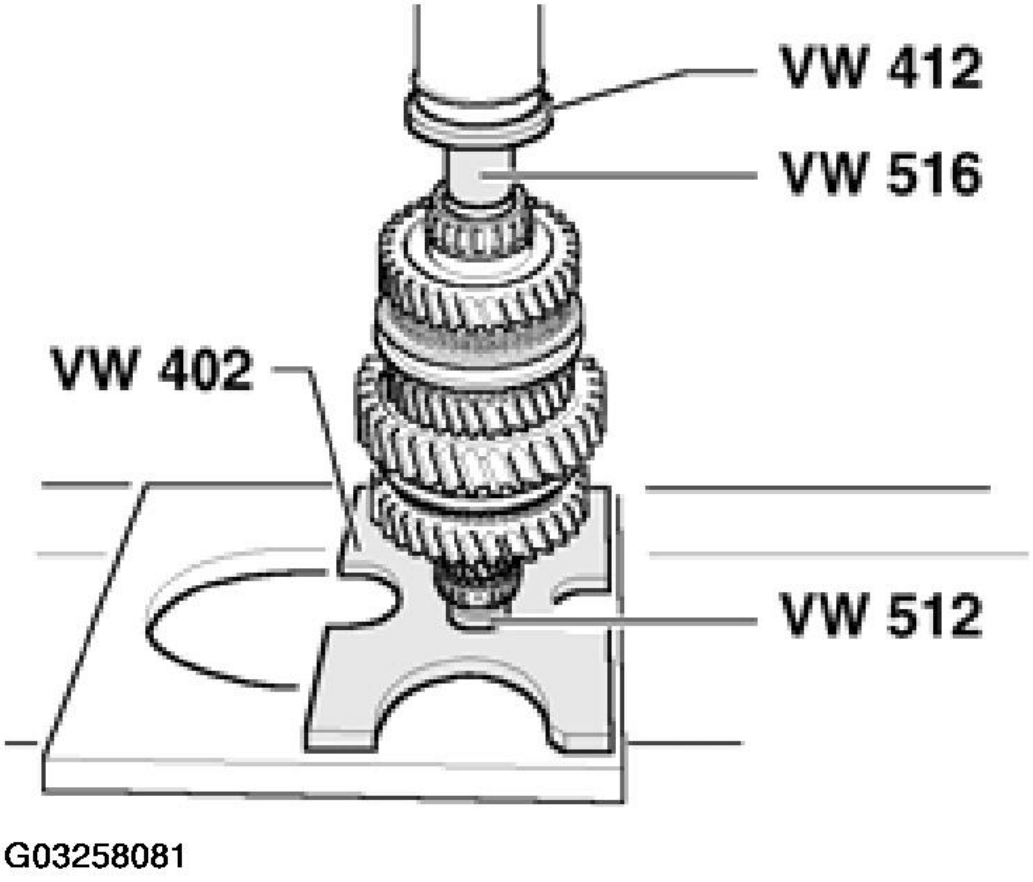


Fig. 112: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Determining Thickness Of Circlip

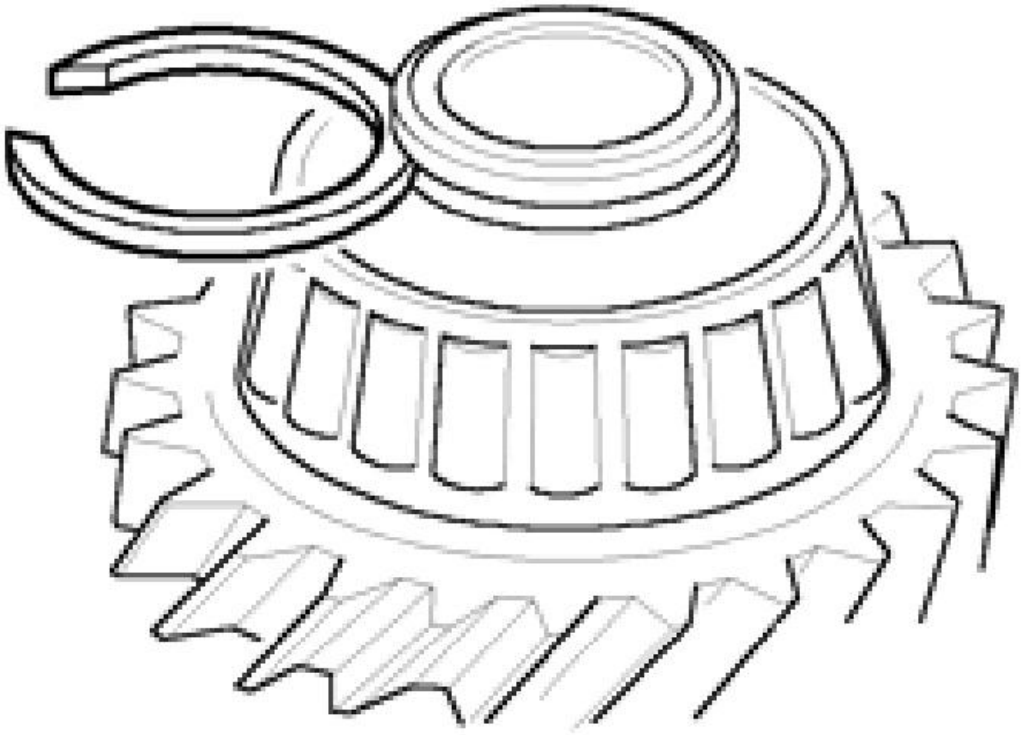


Fig. 113: Determining Thickness Of Circlip
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Determine thickest circlip which will still fit and install it.

The following securing clips are available:

CIRCLIP THICKNESS (OUTPUT SHAFT, 1ST-4TH GEAR)

Thickness (mm)	Spare Part No.
1.79	02M 311 187 G
1.83	02M 311 187 F
1.86	02M 311 187 E
1.89	02M 311 187 D
1.92	02M 311 187 C
1.95	02M 311 187 B
1.98	02M 311 187 A

Pulling Tapered Roller Bearing Outer Race Out From Transmission Housing

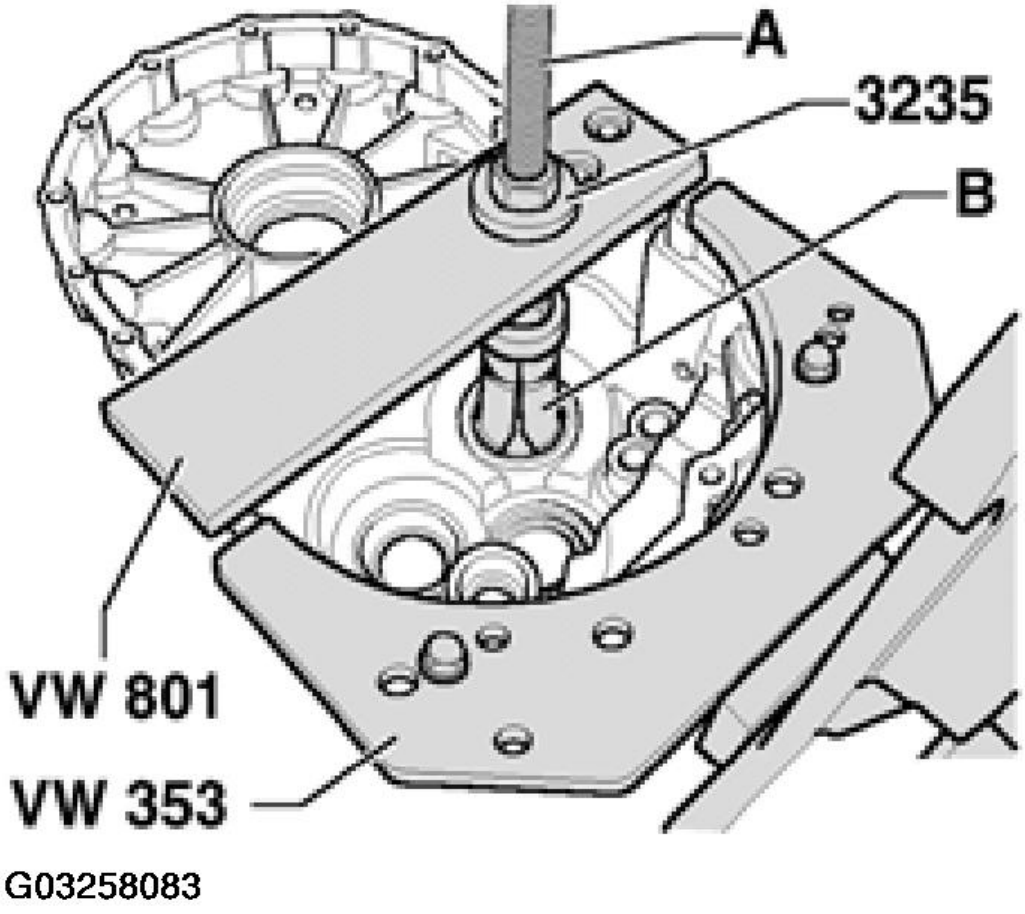


Fig. 114: Pulling Tapered Roller Bearing Outer Race Out From Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Counter support, e.g. Kukko 22/2
B. Internal puller 46 to 58 mm, e.g. Kukko 21/7

Pressing Tapered Roller Bearing Outer Race Into Transmission Housing

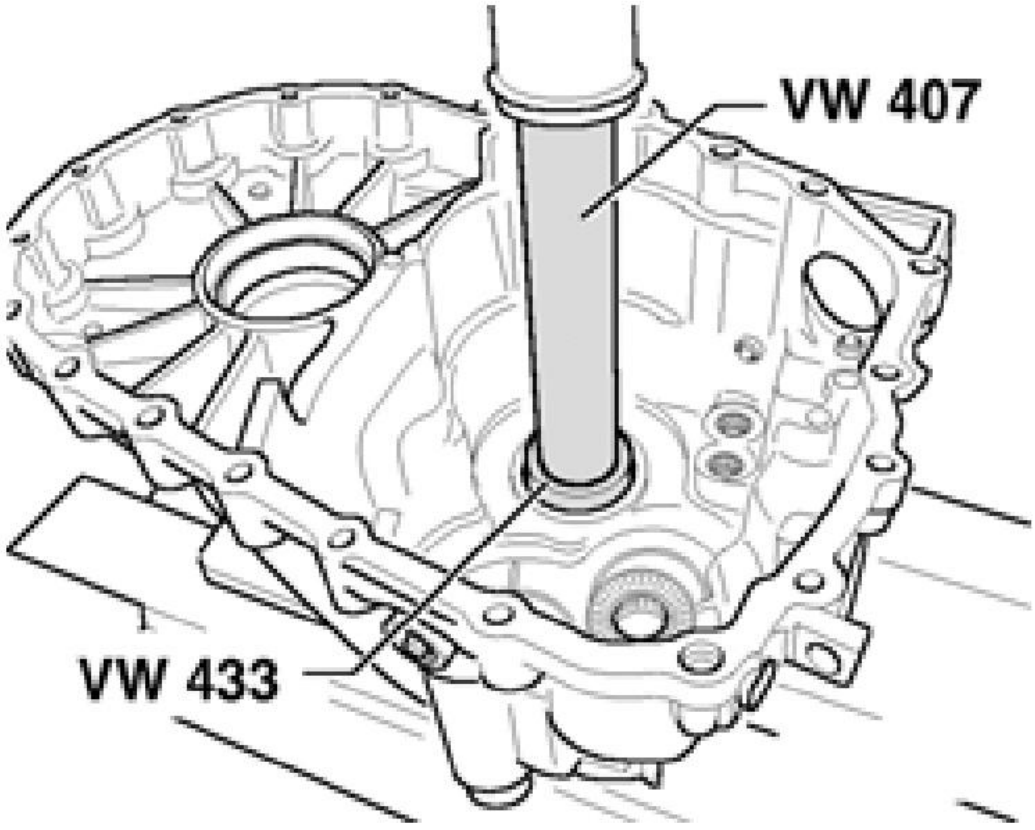


Fig. 115: Pressing Tapered Roller Bearing Outer Race Into Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Fit shim under outer race.
- Support transmission housing with press piece 2050 directly below bearing support.

OUTPUT SHAFT FOR 1ST-4TH GEARS, ADJUSTING

(Determining shim for output shaft)

Special tools and equipment

- VW 353 Transmission support
- VW 387 Universal dial gauge bracket
- VW 407 Press tool

- VW 433 Press piece
- 3253 Installation tool
- VW 801 Holding plate

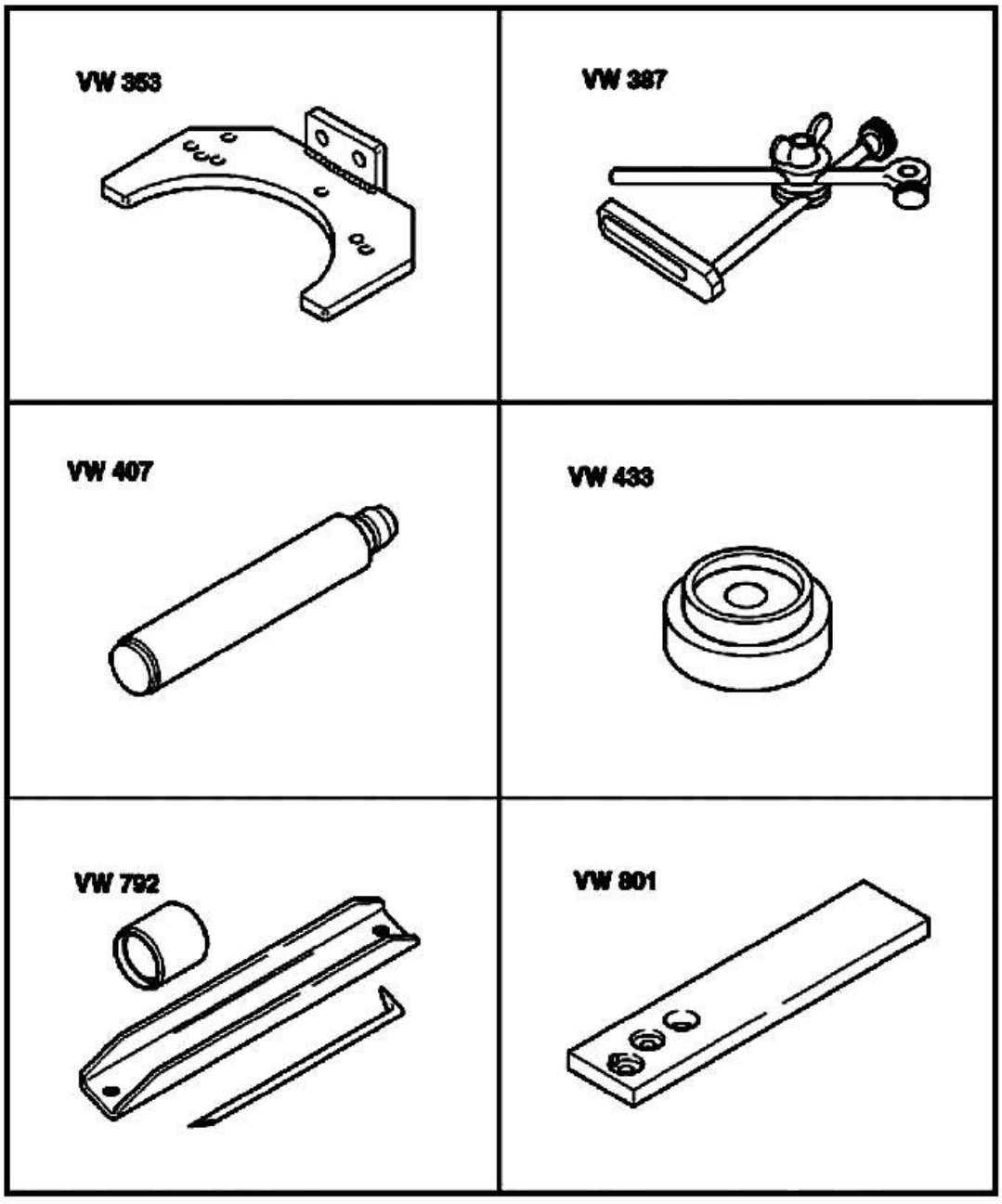
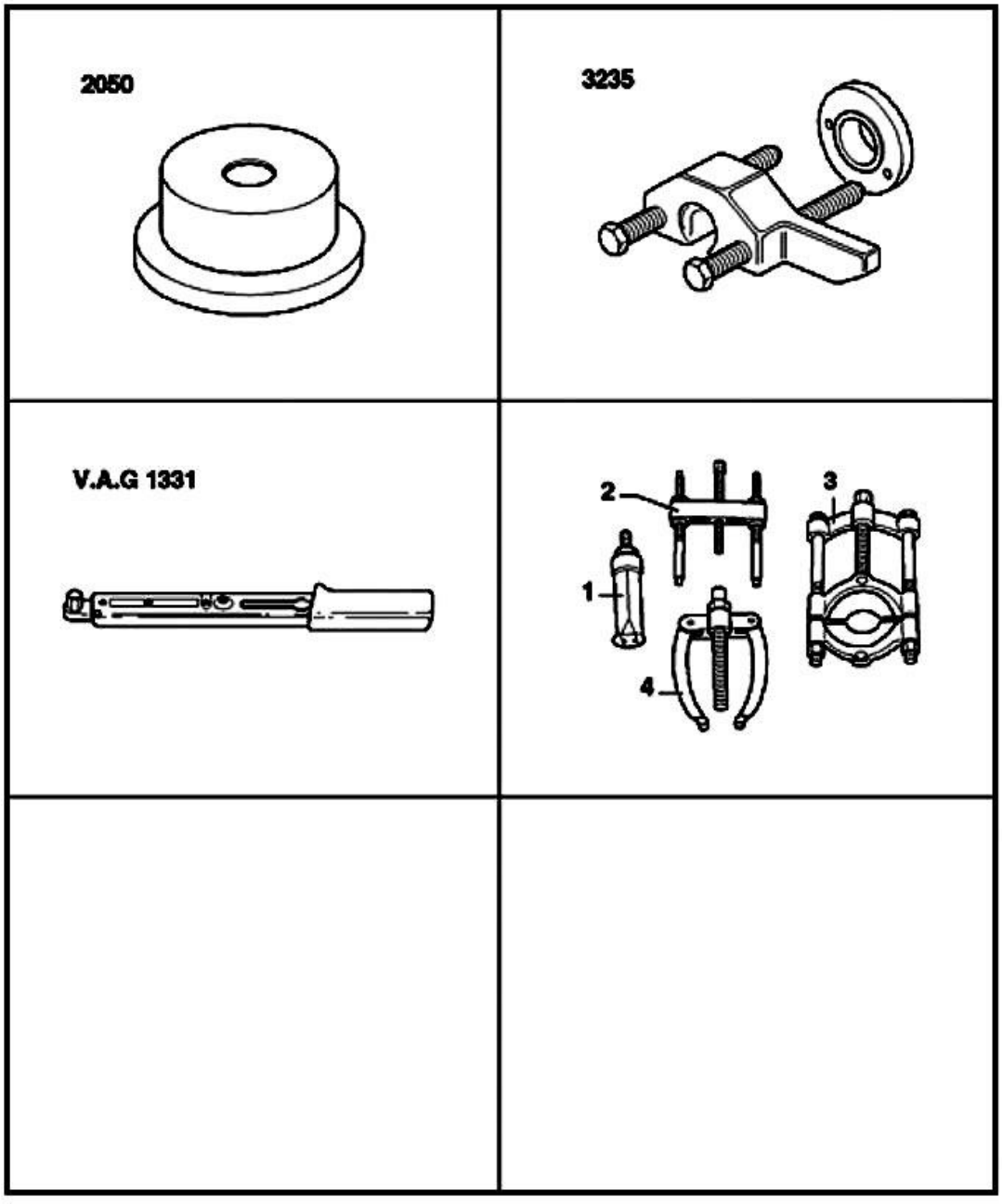


Fig. 116: Identifying Special tools and equipment (1 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 2050 Thrust piece
- 3235 Press
- V.A.G 1331 Torque wrench
- 1 -Kukko 21/7 Internal puller
- 4 - Kukko 22/2 Counter support



G03258086

Fig. 117: Identifying Special tools and equipment (2 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

General information

It is necessary to readjust the output shaft when the following components are replaced:

- Transmission housing
- Clutch housing
- Output shaft for 1st-4th gear

  or

- Tapered roller bearing

Adjustment overview. See **Adjustment overview** .

Requirements

- Sealing surfaces of clutch and transmission housings must be free of sealant.
- When taking measurements, install only the shaft to be measured.

- Press tapered roller bearing outer race with a 1.70 mm thick shim into transmission housing, supporting transmission housing directly under bearing support with thrust piece 2050.

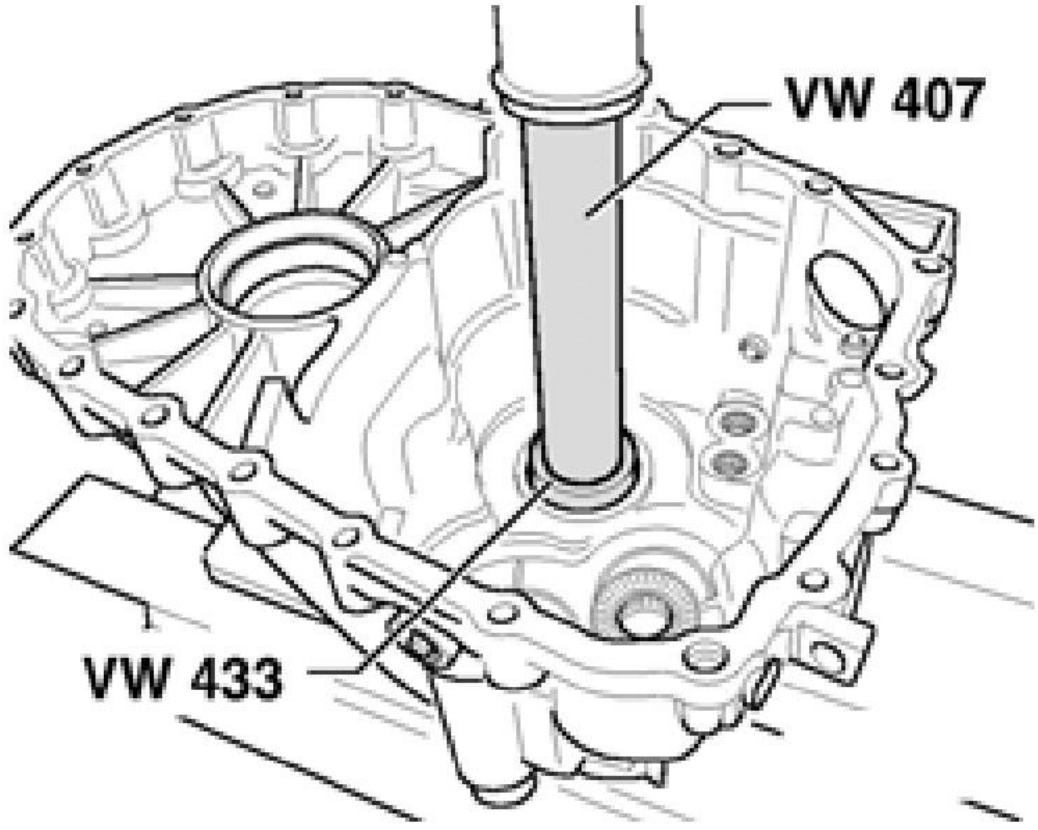


Fig. 118: Pressing Tapered Roller Bearing Outer Race With Shim
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Set complete 1st-4th gear output shaft in clutch housing.
- Fit transmission housing and tighten bolts -A- and -B- diagonally to correct torque.
- Fit measuring tools and secure with bolt (arrow) to clutch housing.

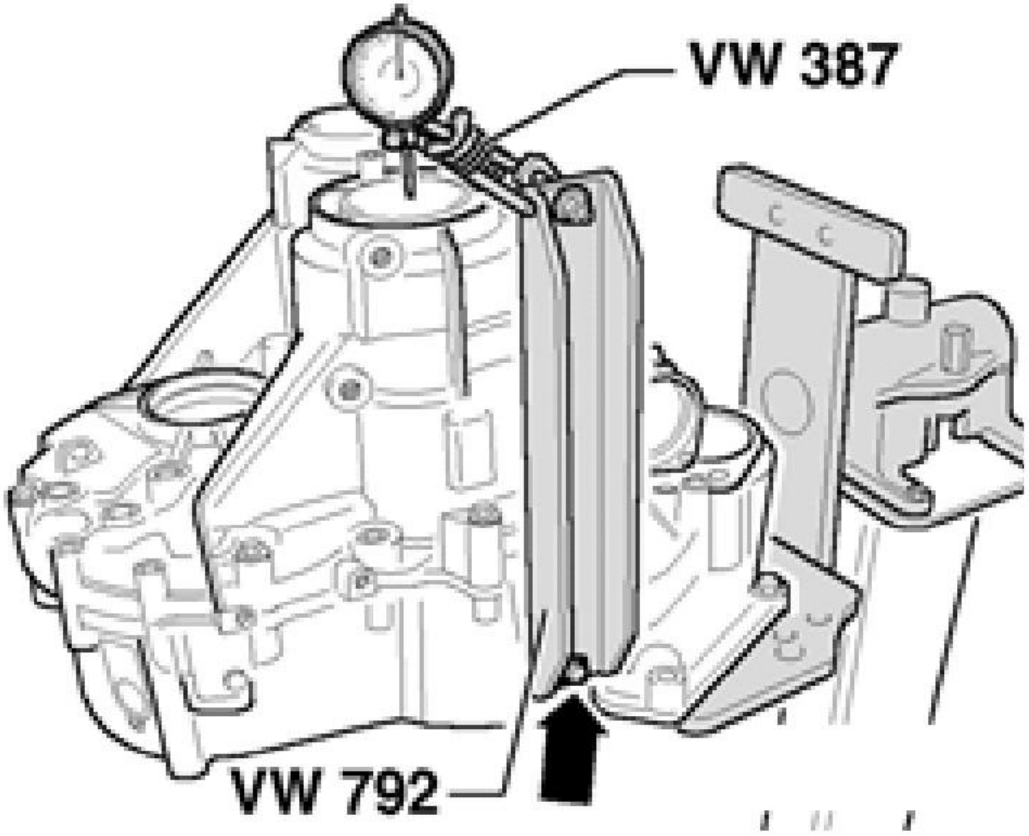


Fig. 119: Fitting Measuring Tools And Securing With Bolt To Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Set dial gauge (3 mm measuring range) to zero with 1 mm preload.
- Loosen clutch housing/transmission housing securing bolts diagonally until bolts release transmission housing or output shaft.
- Read play on gauge and note reading (example: 0.14 mm)

NOTE: If the dial gauge indicates no value when the clutch housing/transmission housing securing bolts are loosened, install shim 1.95 mm (Part No. 084 409 383 AS) or, if necessary, shim 2.20 mm (Part No. 084 409 383 BD).

Determining thickness of shim

The specified bearing pretension will be attained by subtracting the measured value (0.14 mm) from the inserted

shim (1.70 mm) and adding a constant for pressing (0.20 mm).

Example:

SHIM THICKNESS (OUTPUT SHAFT FOR 1ST-4TH GEARS, EXAMPLE ADJUSTING)

Inserted shim	1 70 mm
- Measured value	0.14 mm
+ Preloading (constant)	0.20 mm
Shim thickness	1.76 mm

- Determine thickness of shim from table. See **SHIM TABLE** .
- Remove transmission housing and pull tapered roller bearing outer race out of housing.

NOTE: The following list refers to items in Fig. 120 .

A. Counter support, e.g. Kukko 22/2
B. Internal puller 46 to 58 mm, e.g. Kukko 21/7

- Remove inserted shim (1.70 mm thick) from clutch housing.

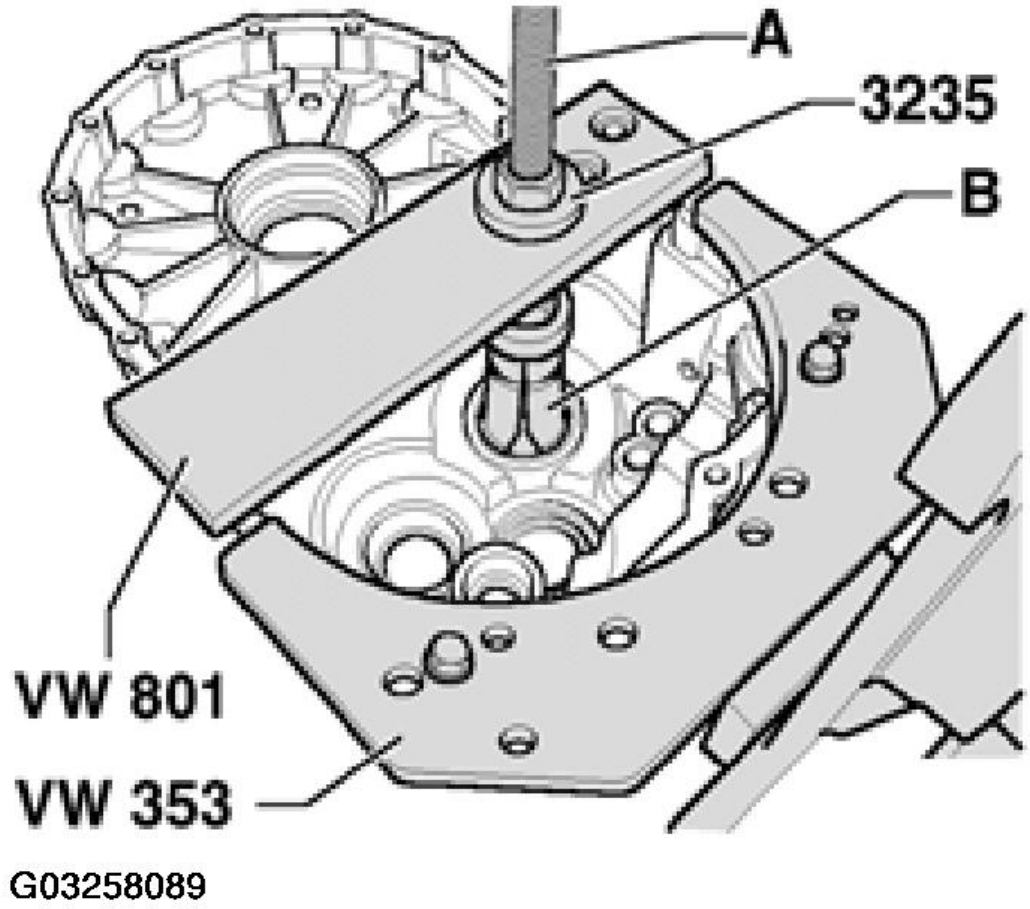


Fig. 120: Removing Transmission Housing And Pulling Tapered Roller Bearing Outer Race Out Of Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Shim table

SHIM (OUTPUT SHAFT FOR 1ST-4TH GEARS)

Size (mm)	Part No.
1.40	084 409 383 AF
1.45	084 409 383 AG
1.50	084 409 383 AH
1.55	084 409 383 AJ
1.60	084 409 383 AK
1.65	084 409 383 AL

1.70	084 409 383 AM
1.75	084 409 383 AN
1.80	084 409 383 AP
1.85	084 409 383 AQ
1.90	084 409 383 AR
1.95	084 409 383 AS
2.00	084 409 383 AT
2.05	084 409 383 BA
2.10	084 409 383 BB
2.15	084 409 383 BC
2.20	084 409 383 BD

Varying tolerances make it possible to obtain the exact shim thickness required.

- Press in tapered roller bearing outer race together with determined shim (in example 1.75 mm) while supporting transmission housing with thrust piece 2050 directly under bearing support.

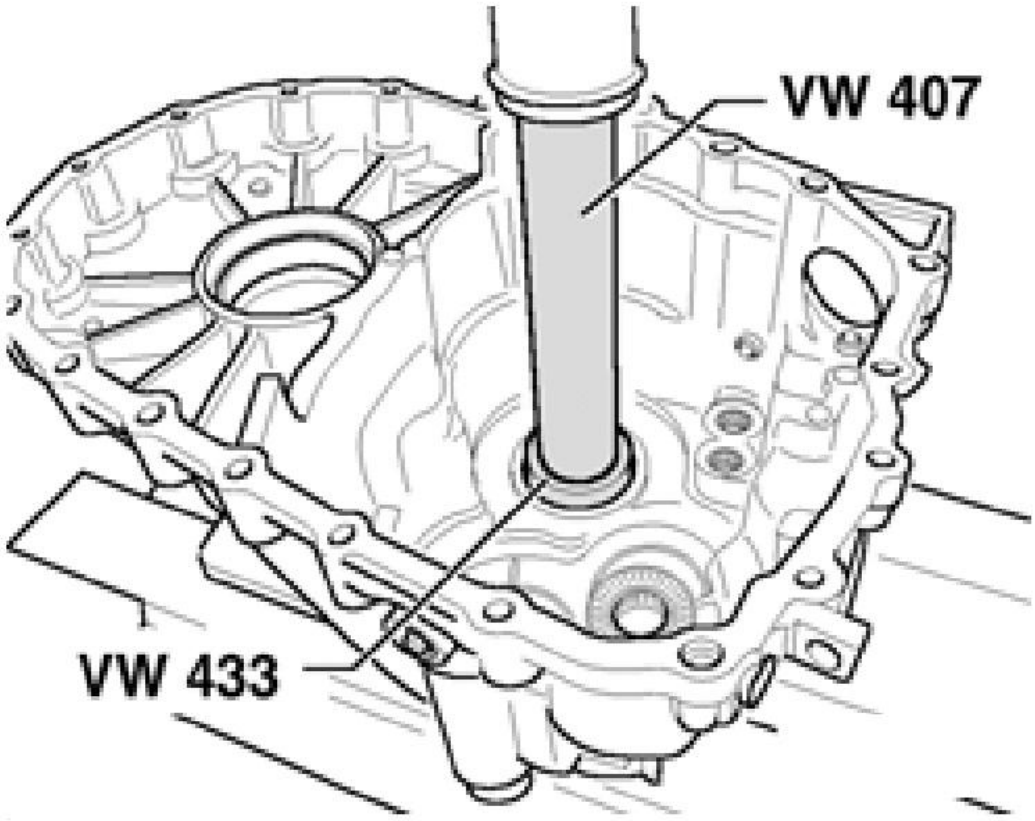


Fig. 121: Pressing In Tapered Roller Bearing Outer Race Together With Determined Shim
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Perform check measurement

- Determined shim installed.
  - Install measuring tools and secure with bolt (arrow) to transmission housing.

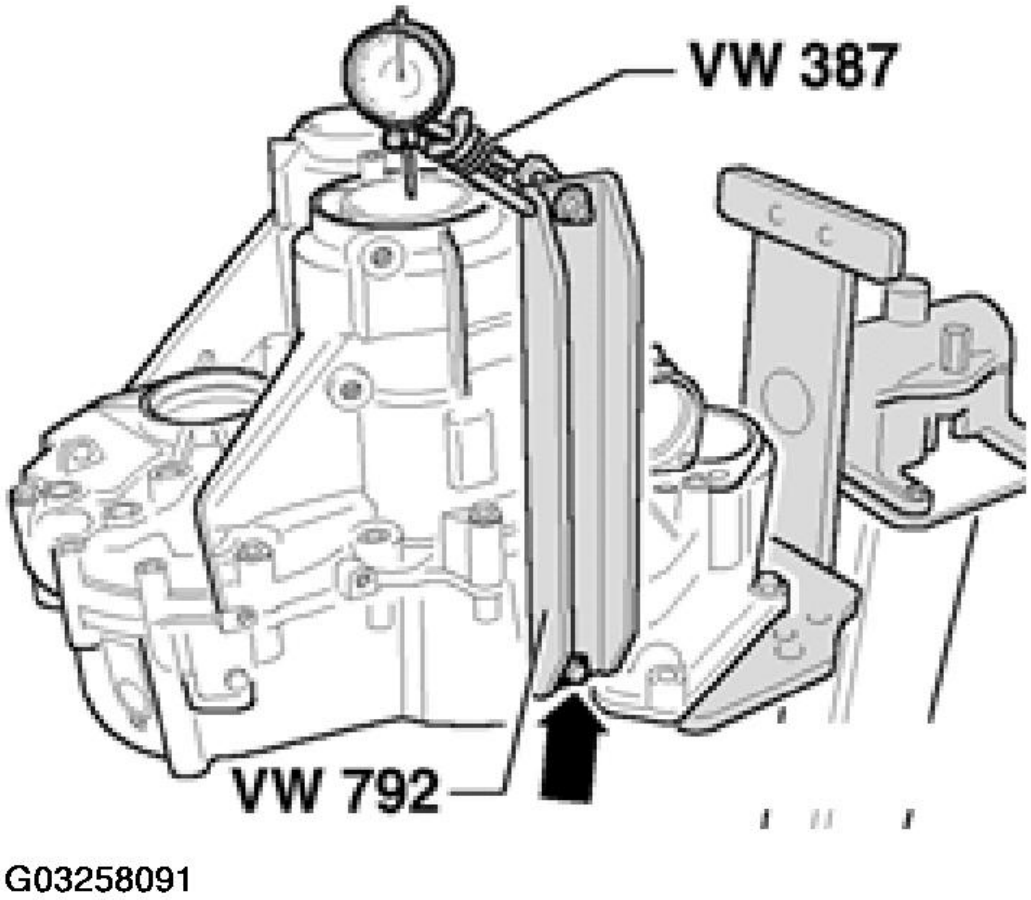


Fig. 122: Installing Measuring Tools And Securing With Bolt To Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Set dial gauge (3 mm measuring range) to zero with 1 mm preload.
- Loosen clutch housing/transmission housing securing bolts diagonally until output shaft is free to move in transmission housing.
- If correct shim has been selected, dial gauge will indicate a value of 0.15 mm to 0.25 mm.

OUTPUT SHAFT FOR 5TH, 6TH AND REVERSE GEAR, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Press tool

- VW 408 A Press tool
- VW 412 Press tool
- VW 415 A Tube

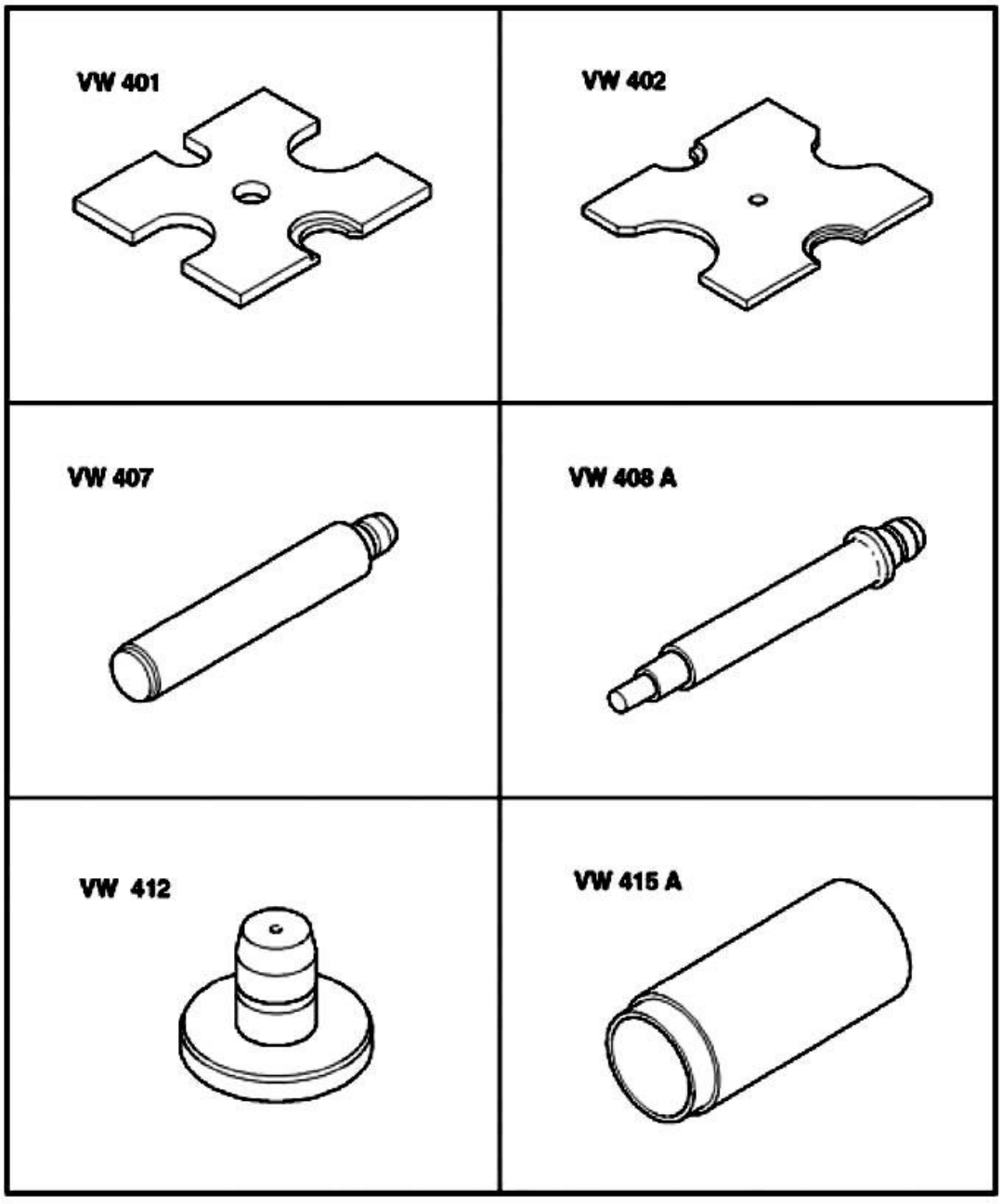


Fig. 123: Identifying Special Tools And Equipment (1 Of 5)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VW 309 Holding plate
- VW 353 Transmission support
- VW 433 Press piece
- VW 454 Press piece
- VW 457 Support rail
- VW 801 Holding plate

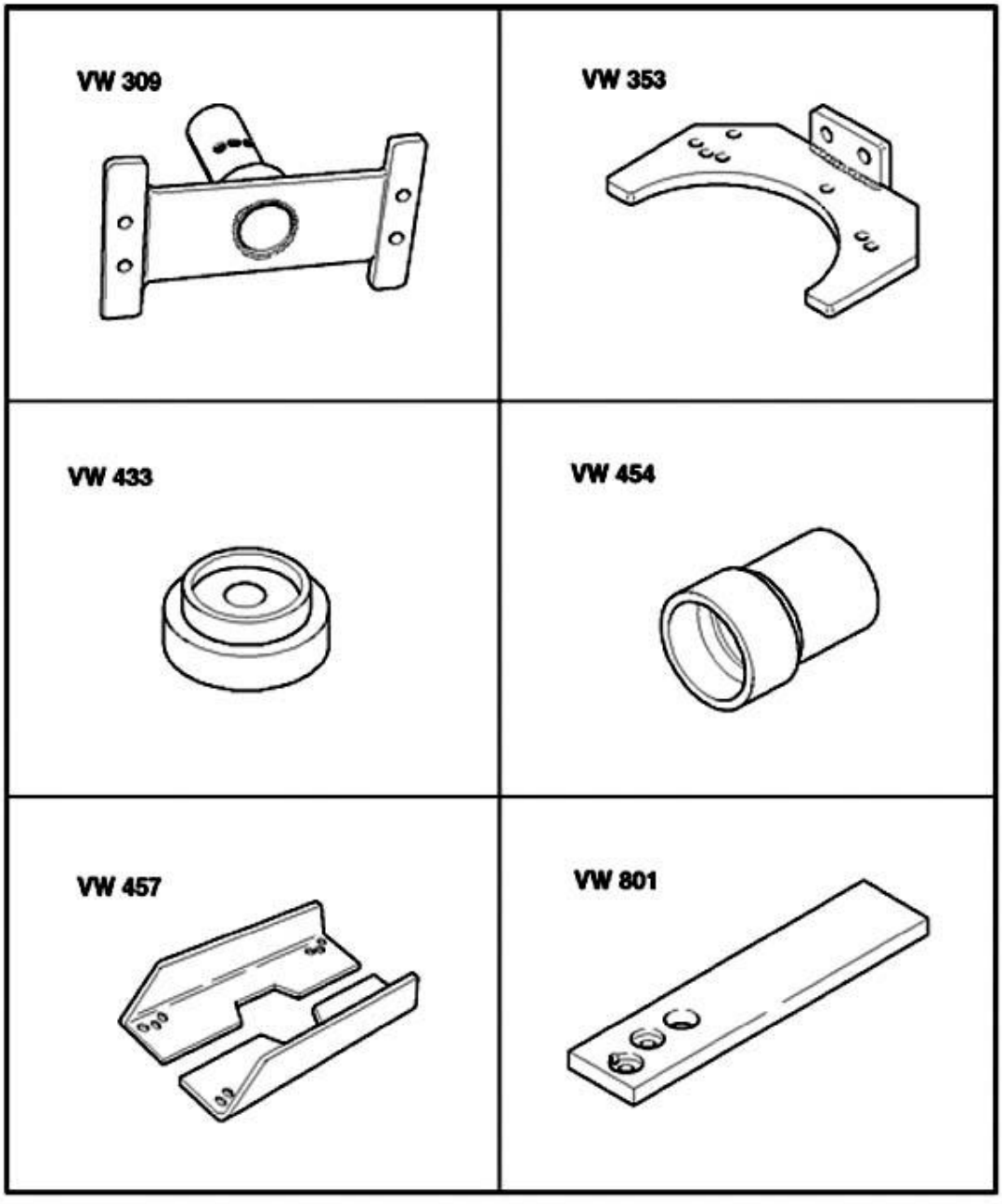


Fig. 124: Identifying Special Tools And Equipment (2 Of 5)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VW 431 Press piece
- VW 455 Fitting sleeve
- VW 510 Press piece

- VW 516 Tube
- VW 519 Tube
- 30-11 Thrust plate

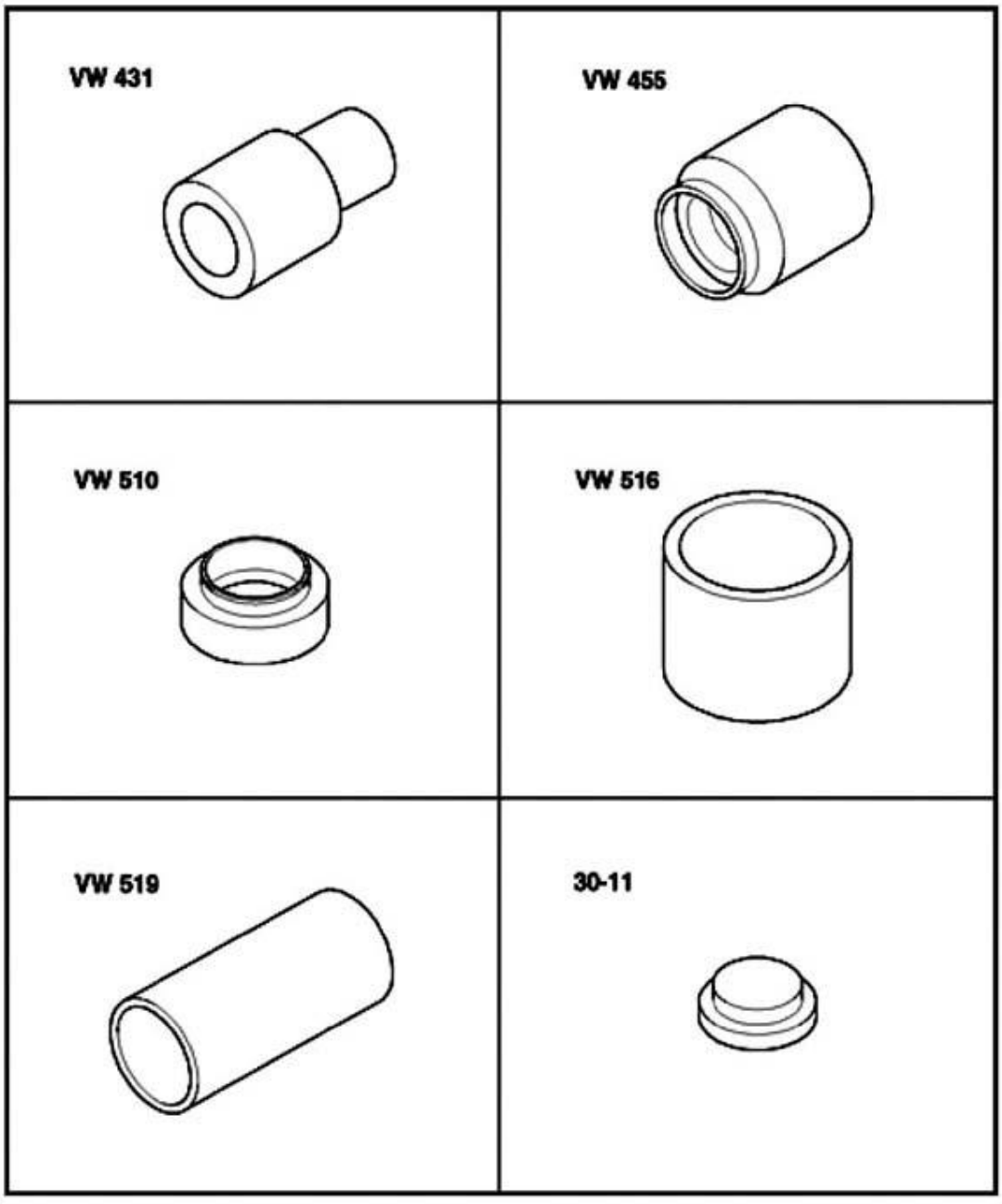
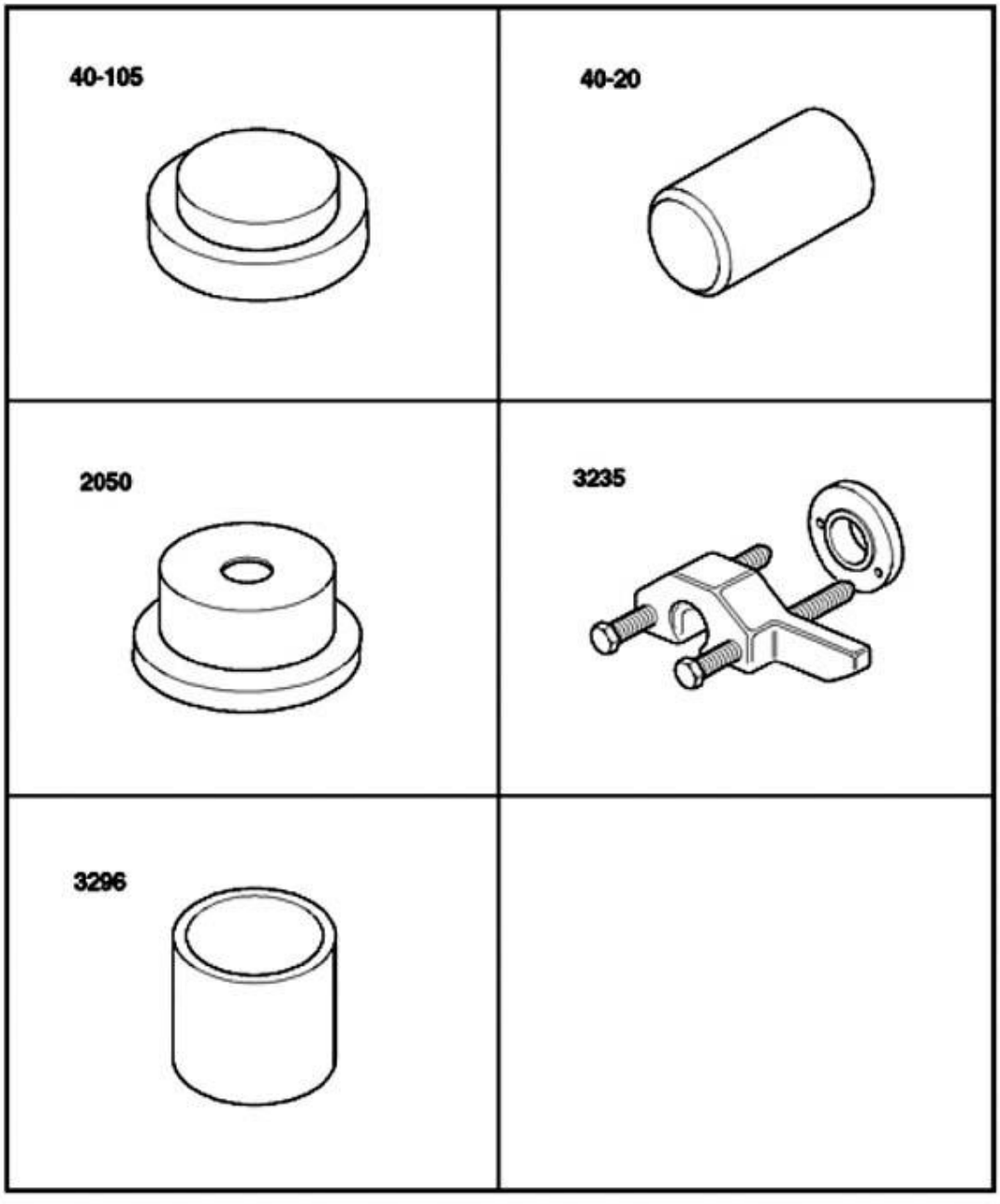


Fig. 125: Identifying Special Tools And Equipment (3 Of 5)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 40-105 Thrust plate
- 40-20 Press tool
- 2050 Thrust piece
- 3235 Press
- 3296 Tube



G03258095

Fig. 126: Identifying Special Tools And Equipment (4 Of 5)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- V.A.G1582 Tapered roller bearing puller
- V.A.G 1582/4 Grip
- V.A.G 1582/7 Grip
- 1 - Kukko 21/7 Internal puller
- 3-Kukko 17/2 Separating device
- 4 - Kukko 22/2 Counter support

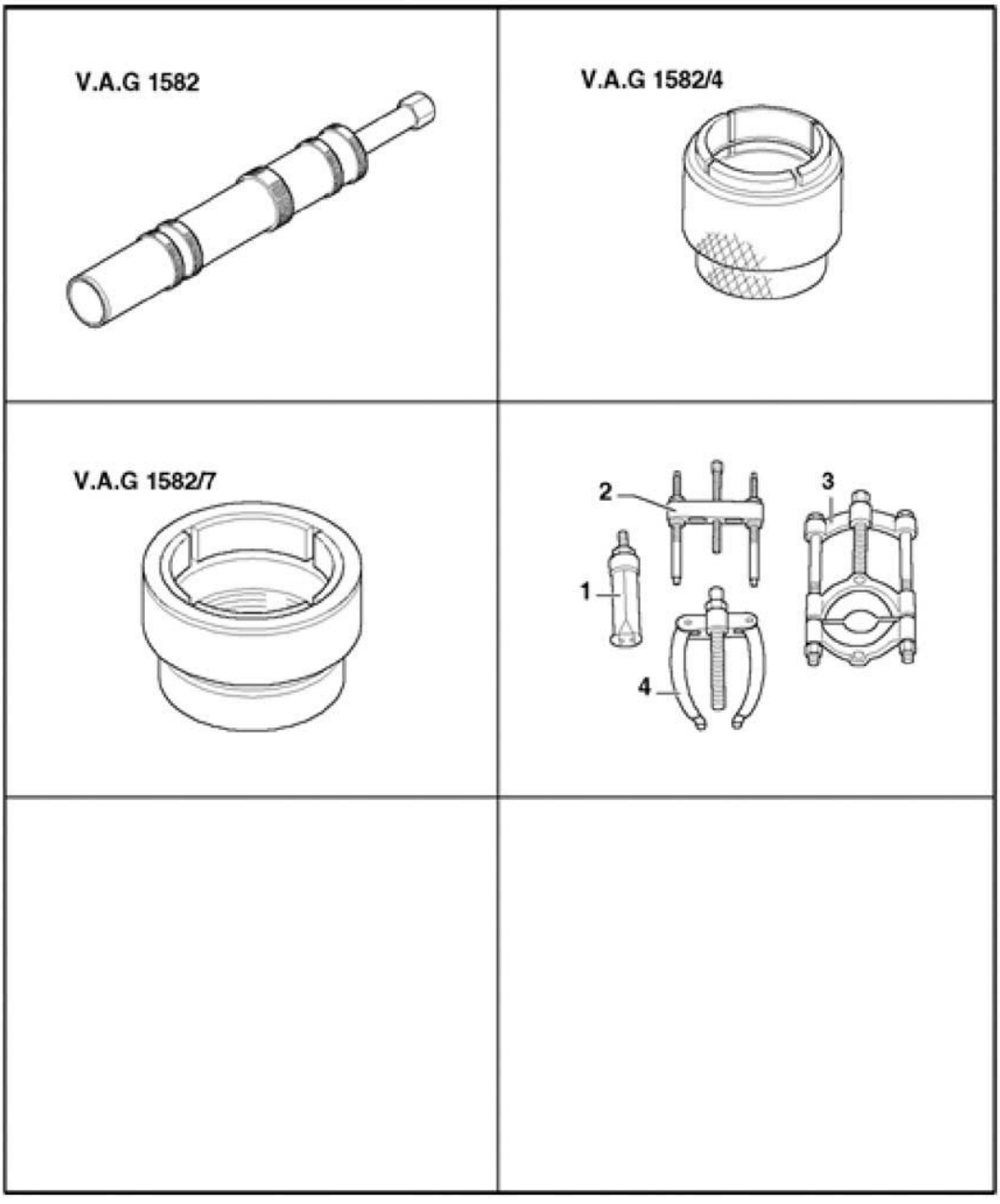


Fig. 127: Identifying Special Tools And Equipment (5 Of 5)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE:

- **When installing new gears or a new output shaft consult technical data. See Code letters, application, ratios, capacities .**
- **If the output shaft or tapered roller bearings have been replaced then**

perform output shaft adjustment. See OUTPUT SHAFT FOR 5TH, 6TH AND REVERSE GEAR, ADJUSTING .

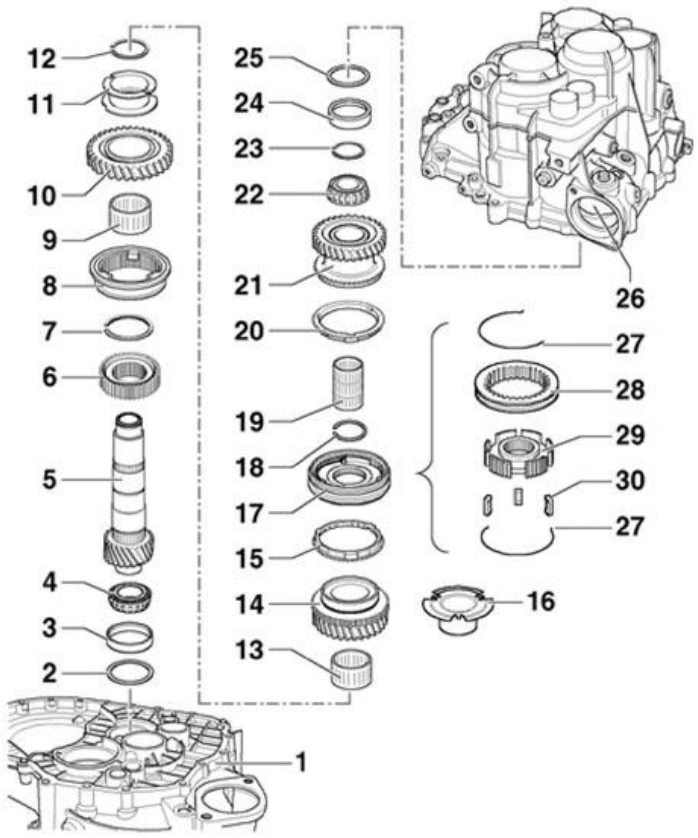
NOTE: The following list refers to items in Fig. 128 .

1. **Clutch housing**
2. **Shim**
   - Always 0.65 mm thick
3. **Outer race/tapered roller bearing**
   - Pulling out. See **Pulling tapered roller bearing outer race out from transmission housing** .
   - Pressing in. See **Pressing tapered roller bearing outer race into transmission housing** .
4. **Tapered roller bearing inner race**
   - Pulling off. See **Pulling off tapered roller bearing inner race** .
   - Pressing on **Pressing on tapered roller bearing inner race** .
5. **Output shaft**
   - For 5th, 6th and reverse gear
   - Adjusting. See **OUTPUT SHAFT FOR 5TH, 6TH AND REVERSE GEAR, ADJUSTING** .
6. **Reverse gear synchro-hub**
   - Pressing off. See **Pressing off reverse gear synchro-hub** .
   - Installation position. See **Installation position of reverse gear synchro-hub** .
   - Pressing on **Pressing on reverse gear synchro-hub** .
7. **Securing clip**
8. **Reverse gear locking collar**
   - Securing clip
9. **Needle roller bearing**
   - For reverse gear
10. **Reverse sliding gear**
11. **Sleeve**
    - Press off with reverse gear. See **Pressing off sleeve -A- over reverse gear wheel** .
    - Installation position: wide shoulder of sleeve faces toward reverse gear
    - **Pressing on sleeve -A-**
12. **Securing clip**
13. **Needle roller bearing**
    - For 6th gear
    - Not in 5-speed manual transmissions
14. **6th gear**
    - Not in 5-speed manual transmissions
15. **6th gear synchro-ring**

- Not in 5-speed manual transmissions
- Checking for wear. See **Checking synchro-ring for wear** .

16. **Spacer sleeve**
    - For 5-speed manual transmission
    - Pull off together with 5th gear locking collar/synchro-hub after removing securing clip (item -18-). See **Pressing off 5th gear synchro-hub/locking collar with spacer sleeve** .
    - Position toward 5th gear locking collar/synchro-hub. See **Positioning spacer sleeve toward 5th gear locking collar/synchro-hub** .
    - Press on together with 5th gear locking collar/synchro-hub. See **Pressing on 5th gear locking collar/synchro-hub together with spacer sleeve** .
17. **5th and 6th gear locking collar with synchro-hub**
    - After removing securing clip, press off together with 6th gear (item -18-). See **Pressing off 5th and 6th gear synchro-hub/locking collar with 6th gear** or for 5-speed manual transmission, with spacer sleeve. See **Pressing off 5th gear synchro-hub/locking collar with spacer sleeve** .
    - Disassembling. See **Disassembling and assembling 5th and 6th gear locking collar and synchro-hub** .
    - Assembling locking collar/synchro hub. See **Disassembling and assembling 5th and 6th gear locking collar and synchro-hub** .
    - Pressing off in 6-speed manual transmission. See **Pressing on 5th and 6th gear locking collar/synchro-hub** .
    - Pressing off in 5-speed manual transmission. See **Pressing on 5th gear locking collar/synchro-hub together with spacer sleeve** .
18. **Securing clip**
19. **Needle roller bearing**
    - For 5th gear
20. **5th gear synchro-ring**
    - Check for wear. See **Checking synchro-ring for wear** .
21. **Selector gear for 5th gear**
22. **Tapered roller bearing inner race**
    - Pulling off. See **Pulling off tapered roller bearing inner race** .
    - **Pressing on tapered roller bearing inner race** .
23. **Securing clip**
    - Redetermine if tapered roller bearing (item -22 -) or output shaft (item - 5 -) are replaced. See **Determining thickness of circlip** .
24. **Outer race/tapered roller bearing**
    - Pulling out. See **Pulling tapered roller bearing outer race out of transmission housing** .
    - Pressing in. See **Pressing tapered roller bearing outer race into transmission housing** .
25. **Shim**
    - Determining thickness. See **OUTPUT SHAFT FOR 5TH, 6TH AND REVERSE GEAR, ADJUSTING** .

26. **Transmission housing**
27. **Spring**
    - Installation position. See **Assembling 5th and 6th gear locking collar/synchro-hub** .
28. **Locking collar**
29. **Synchro-hub**
30. **Locking pieces (Qty. 3)**
    - Installation position. See **Disassembling and assembling 5th and 6th gear locking collar and synchro-hub** .



1 - Clutch housing
2 - Shim
3 - Outer race/tapered roller bearing
4 - Tapered roller bearing inner race
5 - Output shaft
6 - Reverse gear synchro-hub
7 - Securing clip
8 - Reverse gear locking collar
9 - Needle roller bearing
10 - Reverse sliding gear
11 - Sleeve
12 - Securing clip
13 - Needle roller bearing
14 - 6th gear
15 - 6th gear synchro-ring
16 - Spacer sleeve
17 - 5th and 6th gear locking collar with synchro-hub
18 - Securing clip
19 - Needle roller bearing
20 - 5th gear synchro-ring
21 - Selector gear for 5th gear
22 - Tapered roller bearing inner race
23 - Securing clip
24 - Outer race/tapered roller bearing
25 - Shim
26 - Transmission housing
27 - Spring
28 - Locking collar
29 - Synchro-hub
30 - Locking pieces (Qty. 3)

G03258097

Fig. 128: Disassembling And Assembling Output Shaft For 5th, 6th And Reverse Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling tapered roller bearing outer race out from transmission housing

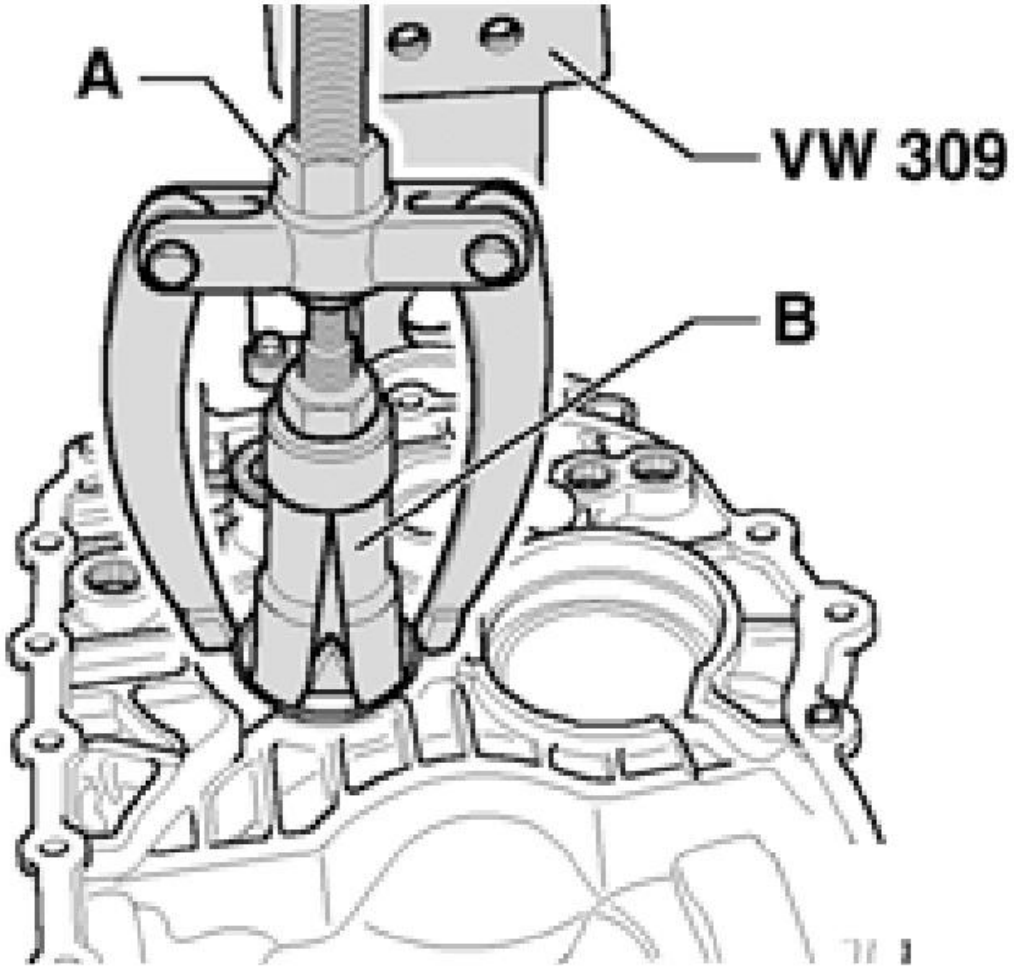


Fig. 129: Pulling Tapered Roller Bearing Outer Race Out From Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Counter support, e.g. Kukko 22/2
B. Internal puller 46 to 58 mm, e.g. Kukko 21/7

NOTE: After pressing out, check washer for damage and replace if necessary.

Pressing tapered roller bearing outer race into transmission housing

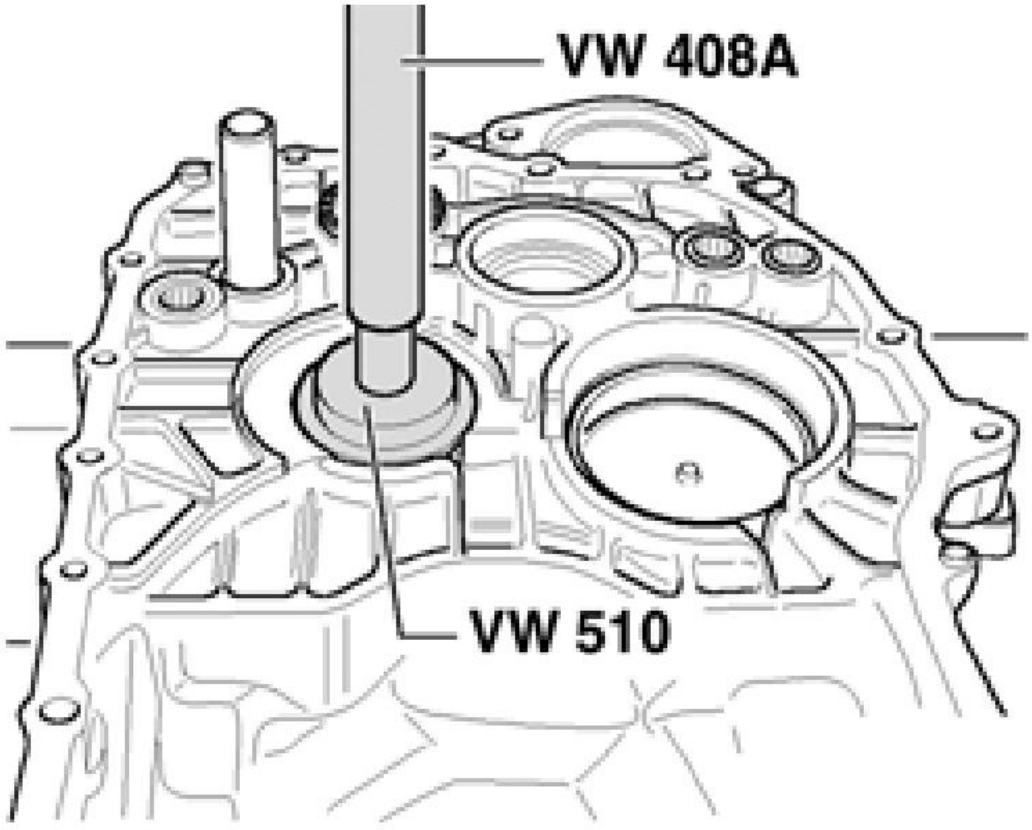


Fig. 130: Pressing Tapered Roller Bearing Outer Race Into Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install washer under outer race.
- Support transmission housing with press tool 40-20 directly below bearing mounting.

Pulling off tapered roller bearing inner race

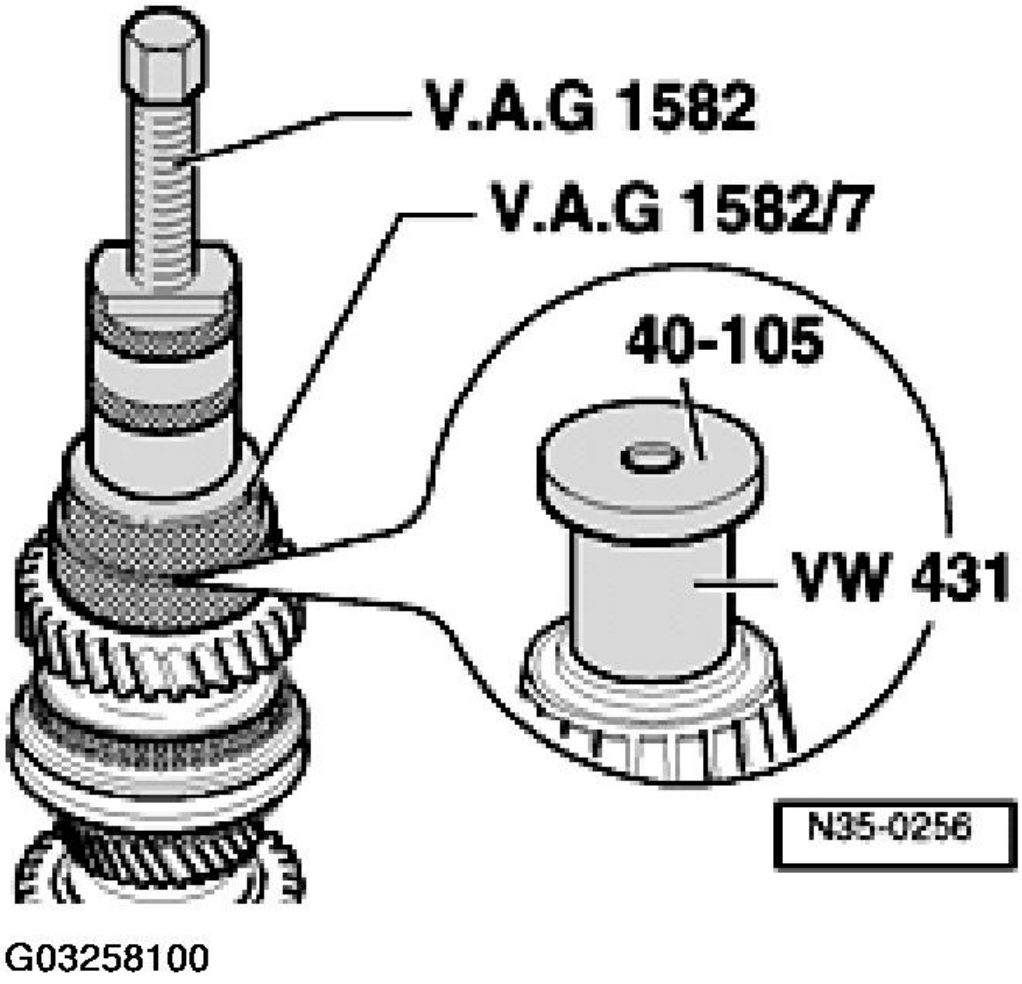


Fig. 131: Pulling Off Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Before mounting extractor, position press piece VW 431 and thrust plate 40-105 on output shaft.

Pressing off 5th and 6th gear synchro-hub/locking collar with 6th gear

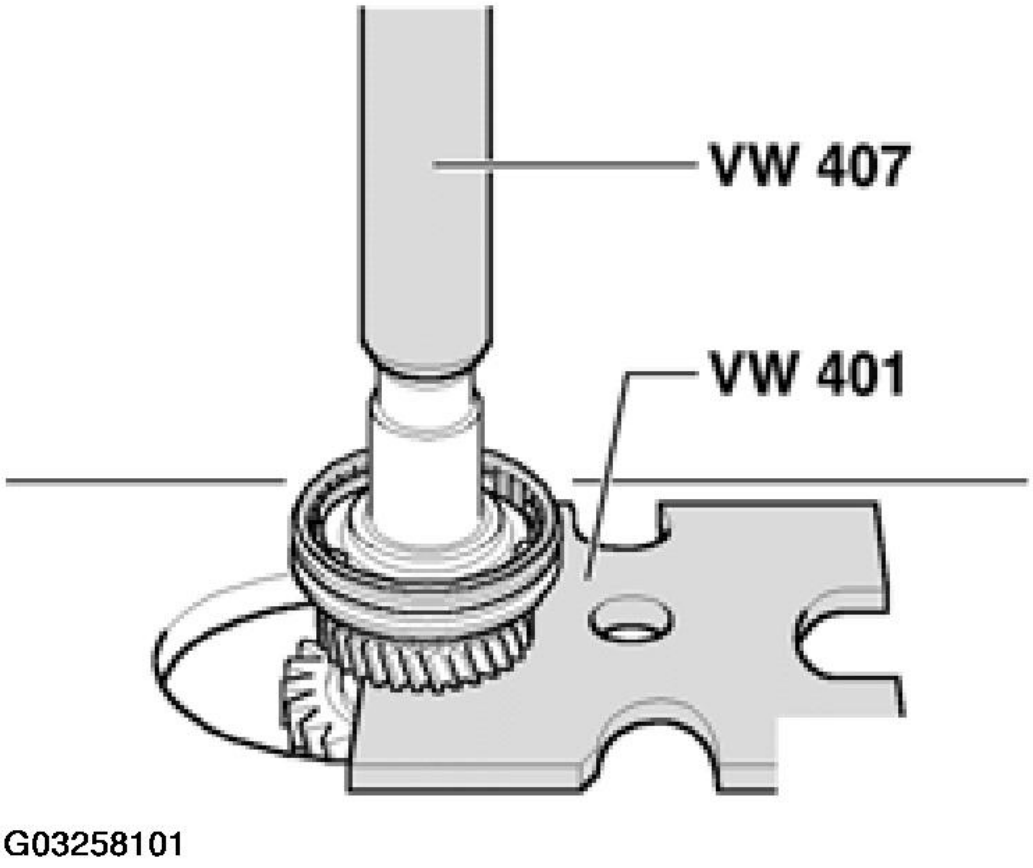


Fig. 132: Pressing Off 5th And 6th Gear Synchro-Hub/Locking Collar With 6th Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing off 5th gear synchro-hub/locking collar with spacer sleeve

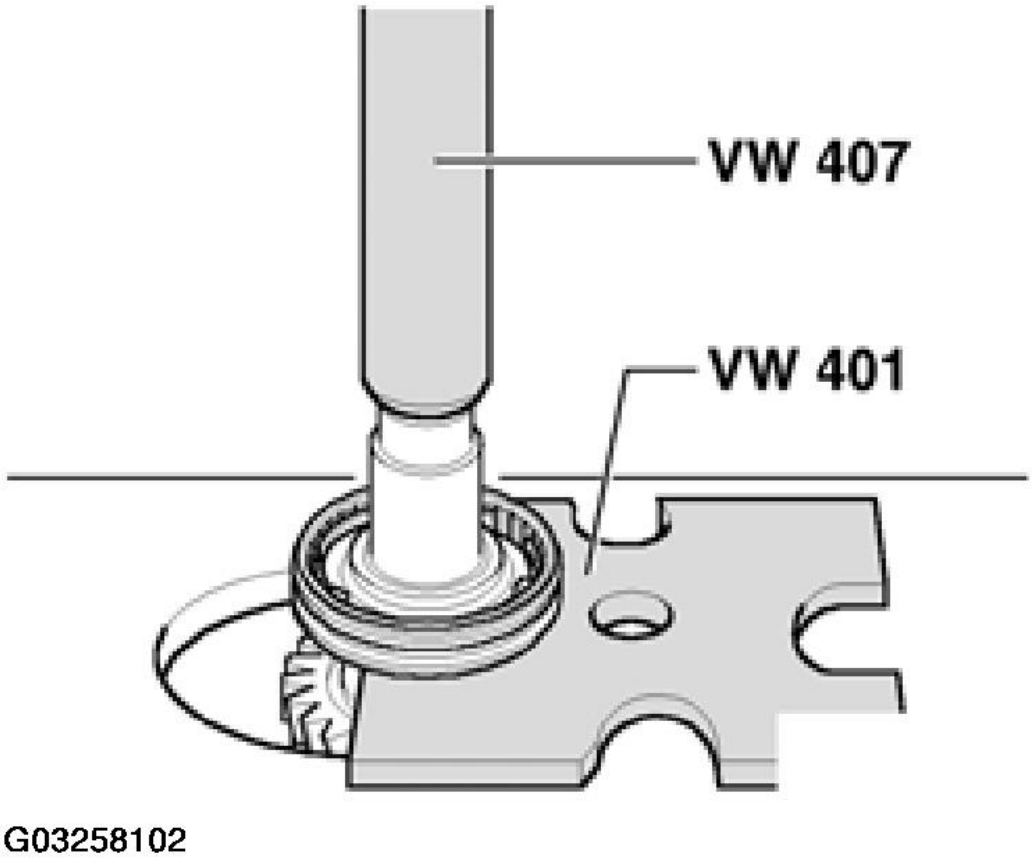


Fig. 133: Pressing Off 5th Gear Synchro-Hub/Locking Collar With Spacer Sleeve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing off sleeve -A- over reverse gear wheel

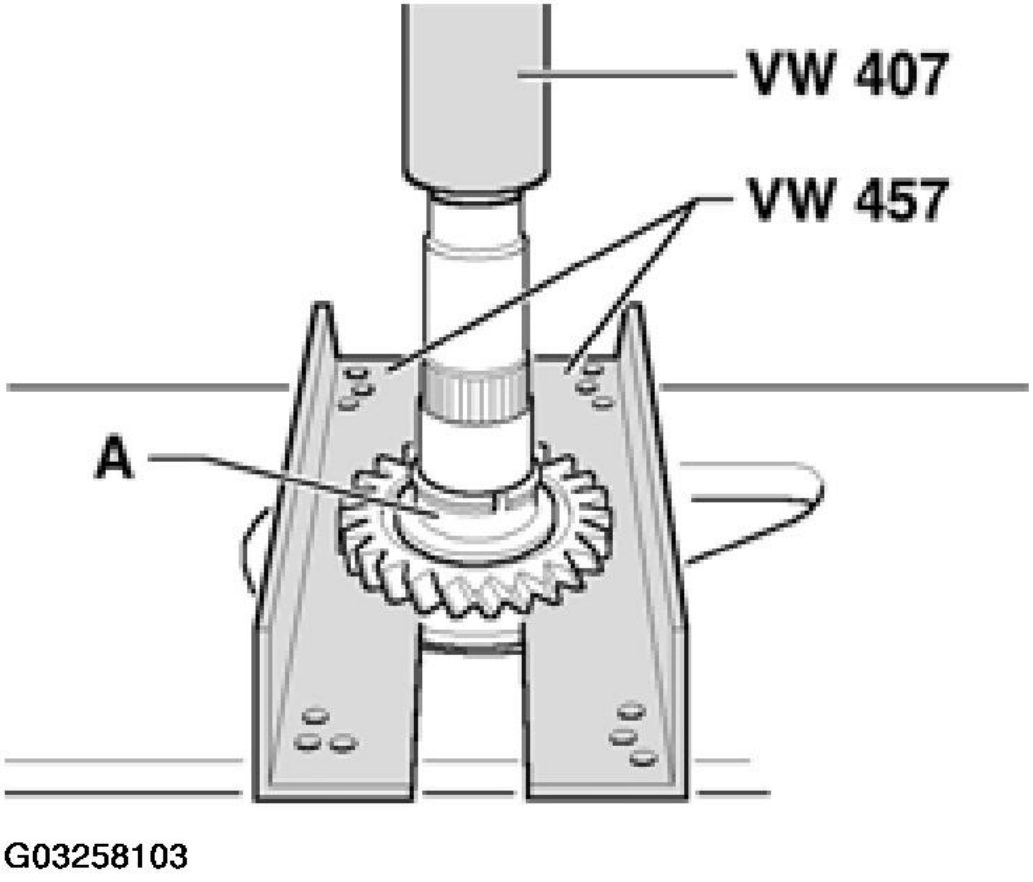


Fig. 134: Pressing Off Sleeve -A- Over Reverse Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing off reverse gear synchro-hub

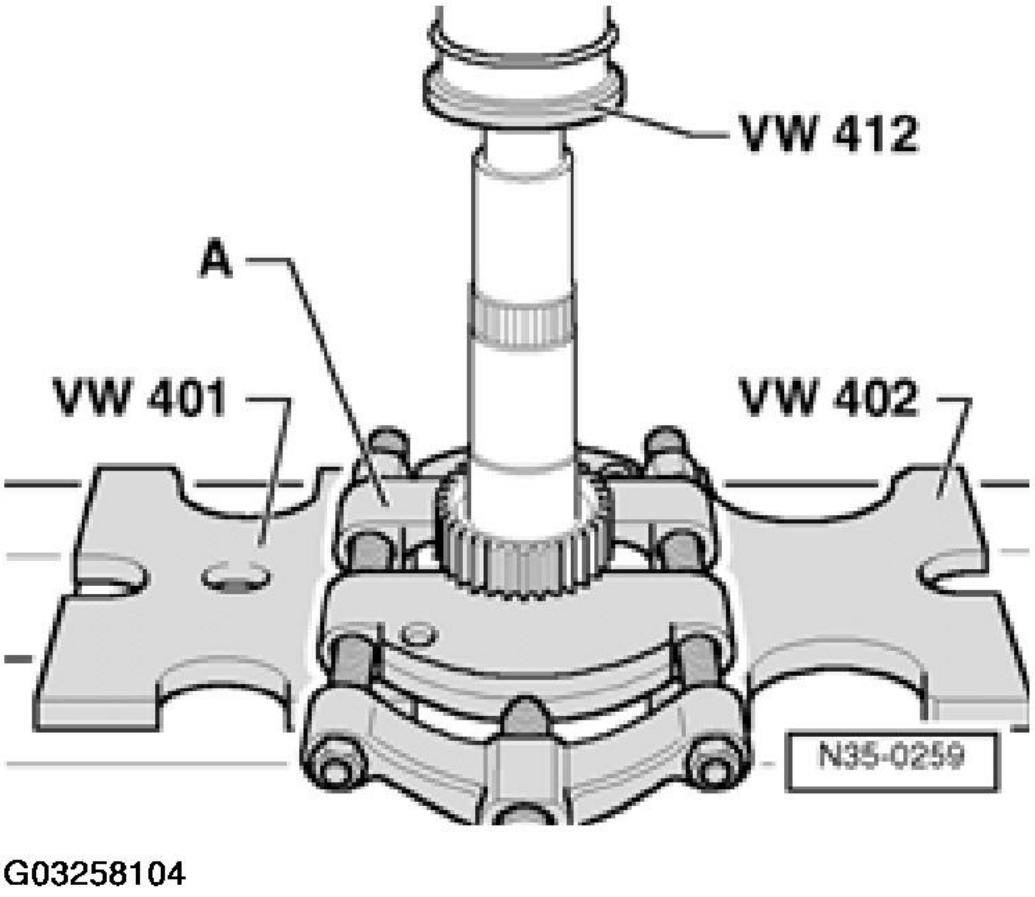


Fig. 135: Pressing Off Reverse Gear Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Separating device 22 to 115 mm, e.g. Kukko 17/2

Pulling off tapered roller bearing inner race

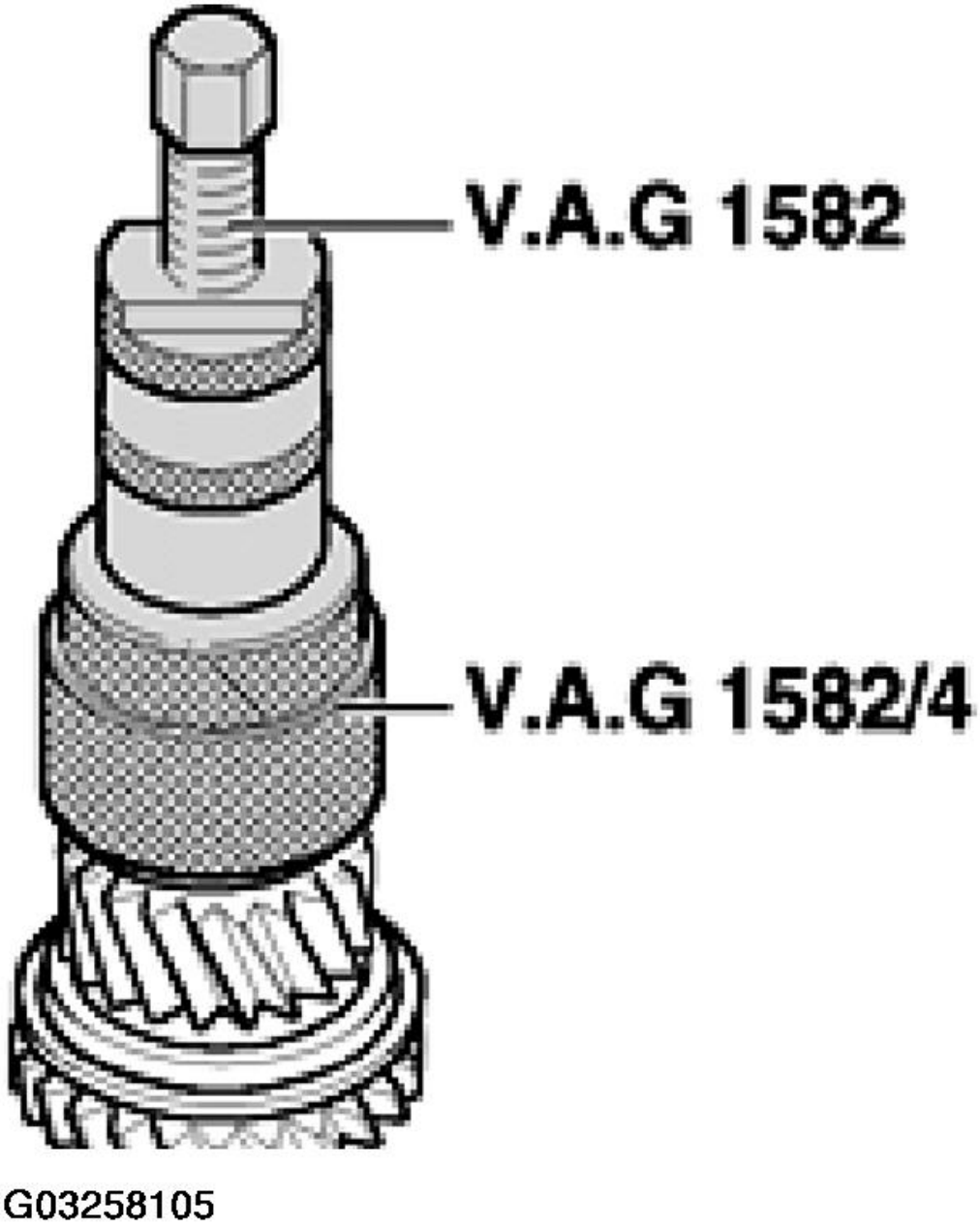


Fig. 136: Pulling Off Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Before mounting extractor, set thrust plate 30-11 on output shaft.

Installation position of reverse gear synchro-hub

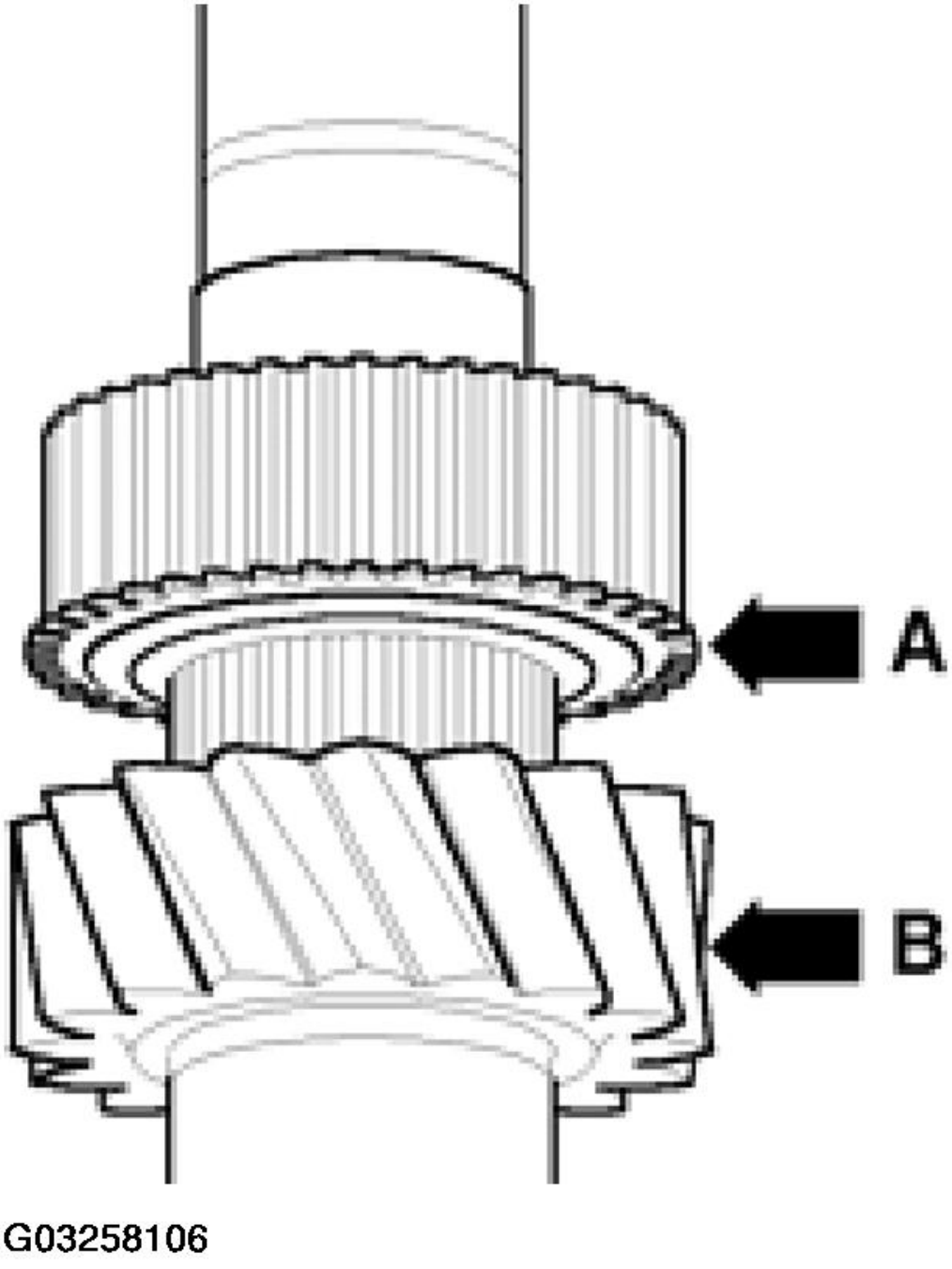


Fig. 137: Identifying Installation Position Of Reverse Gear Synchro-Hub

Courtesy of VOLKSWAGEN OF AMERICA, INC.

Reverse gear locking collar stop (arrow -A-) faces toward toothing of output shaft (arrow -B-).

Pressing on reverse gear synchro-hub

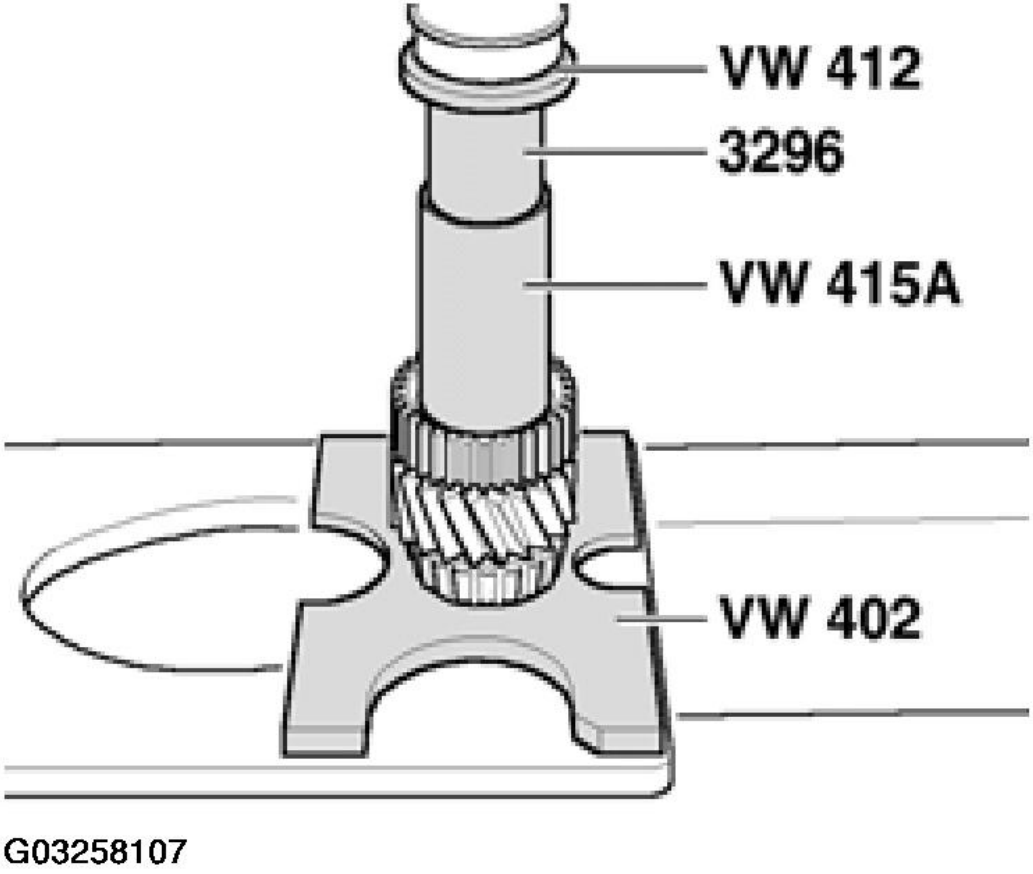


Fig. 138: Pressing On Reverse Gear Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing on sleeve -A-

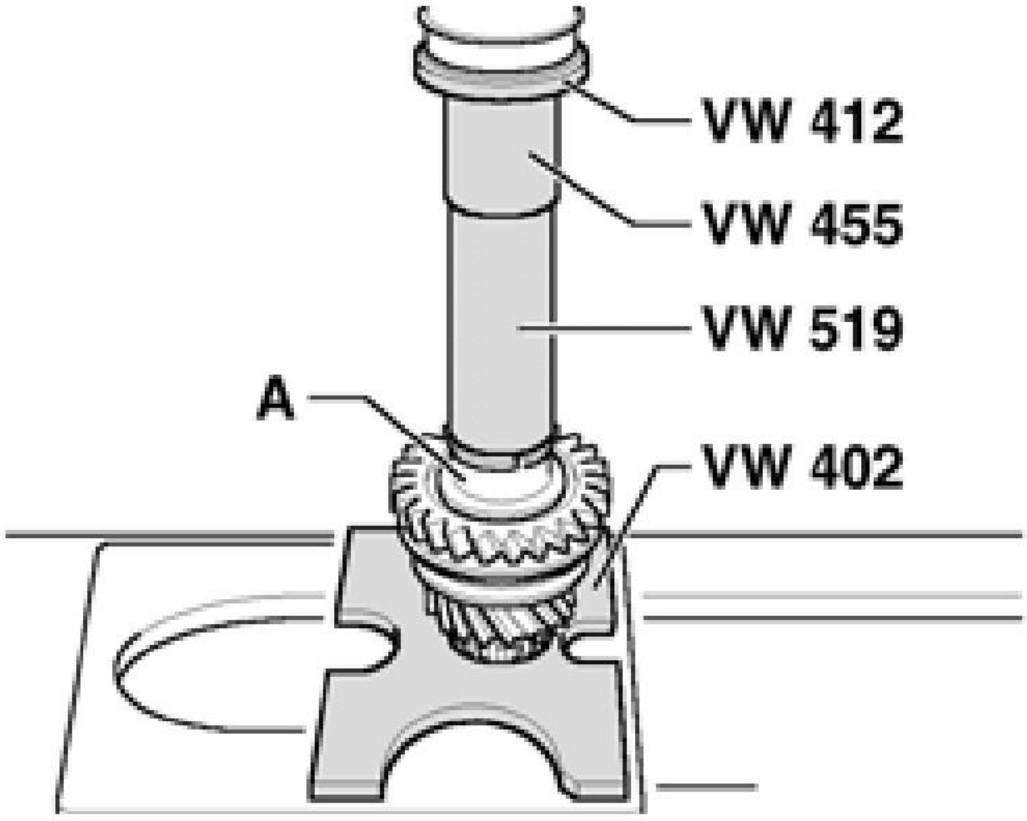


Fig. 139: Pressing On Sleeve -A-
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Installation position: Wide collar faces toward reverse gear.

Checking synchro-ring for wear

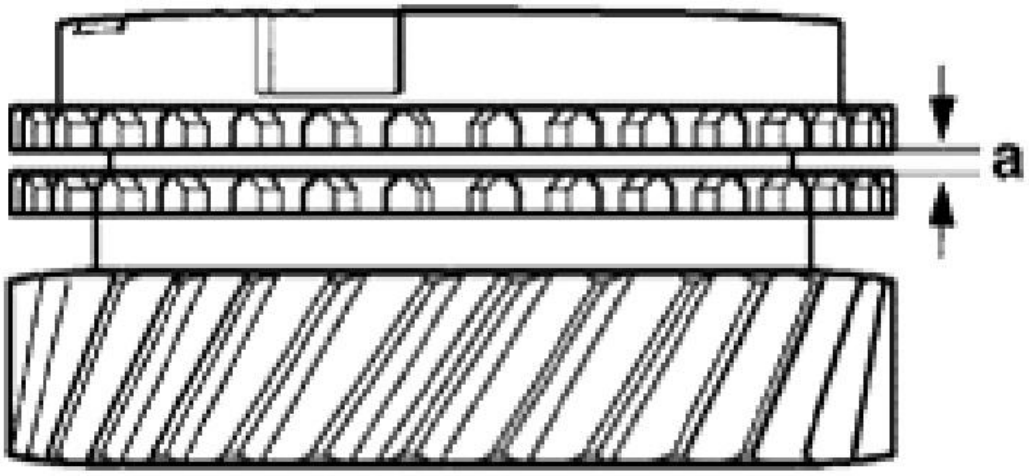


Fig. 140: Checking Synchro-Ring For Wear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press synchro-ring onto gear cone and measure gap "a" with feeler gauge.

WEAR LIMIT (OUTPUT SHAFT FOR 5TH, 6TH AND REVERSE GEAR)

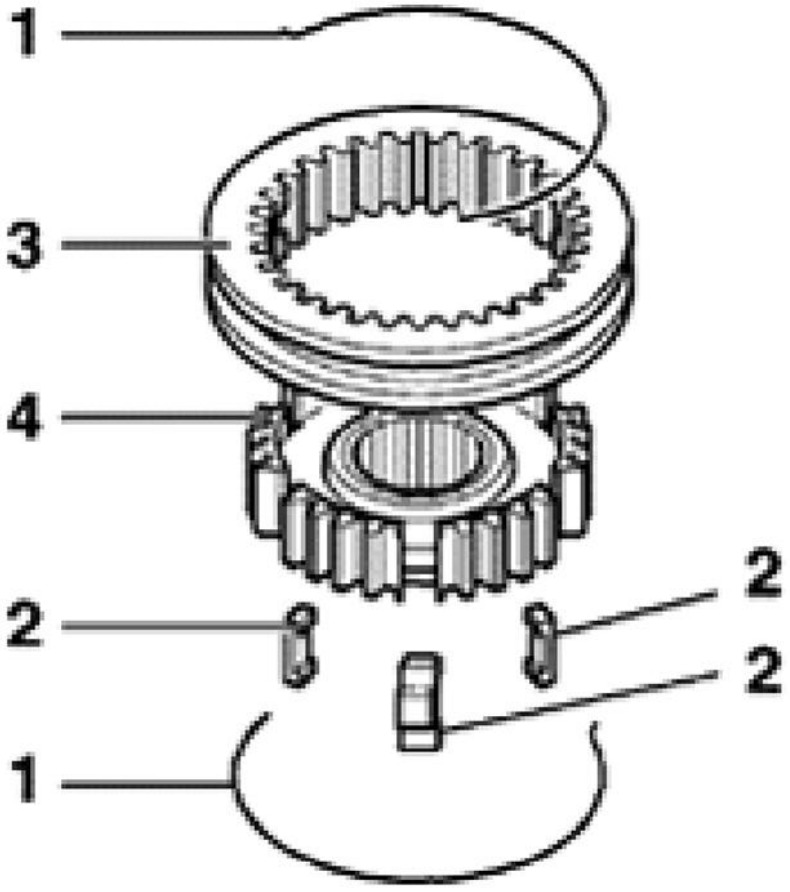
Gap "a"	New dimension	Wear limit
5th and 6th gear	1.0 ... 1.7 mm	0.5 mm

Disassembling and assembling 5th and 6th gear locking collar and synchro-hub

NOTE: The following list refers to items in Fig. 141 .

1. Spring
2. Locking piece
3. Locking collar
4. Synchro-hub
    - Slide locking collar over synchro-hub.

The recesses for locking pieces in synchro-hub and locking collar must align.



1 - Spring

2 - Locking piece

3 - Locking collar

4 - Synchro-hub

G03258110

Fig. 141: Disassembling And Assembling 5Th And 6Th Gear Locking Collar And Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Assembling 5th and 6th gear locking collar/synchro-hub

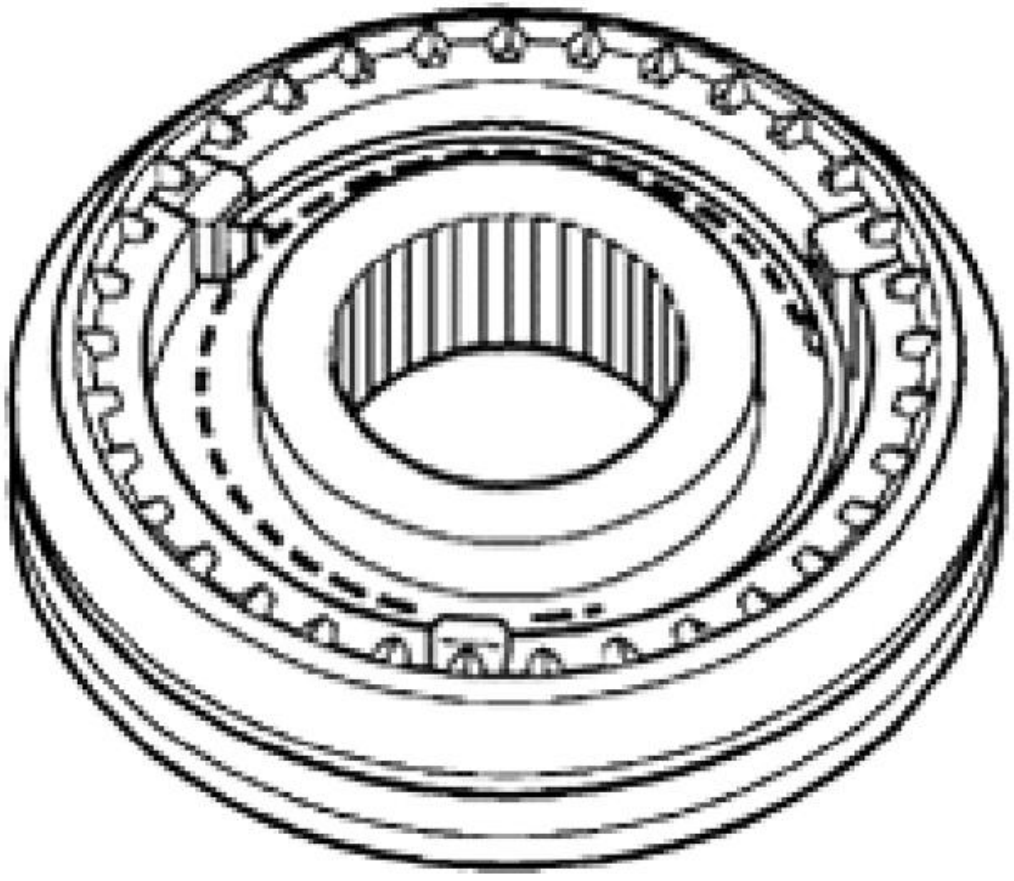


Fig. 142: Assembling 5th And 6th Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The locking collar has been pushed over the synchro-hub.

- Insert locking pieces and install springs 120 offset. Angled end of spring must locate in hollow locking piece.

Pressing on 5th and 6th gear locking collar/synchro-hub

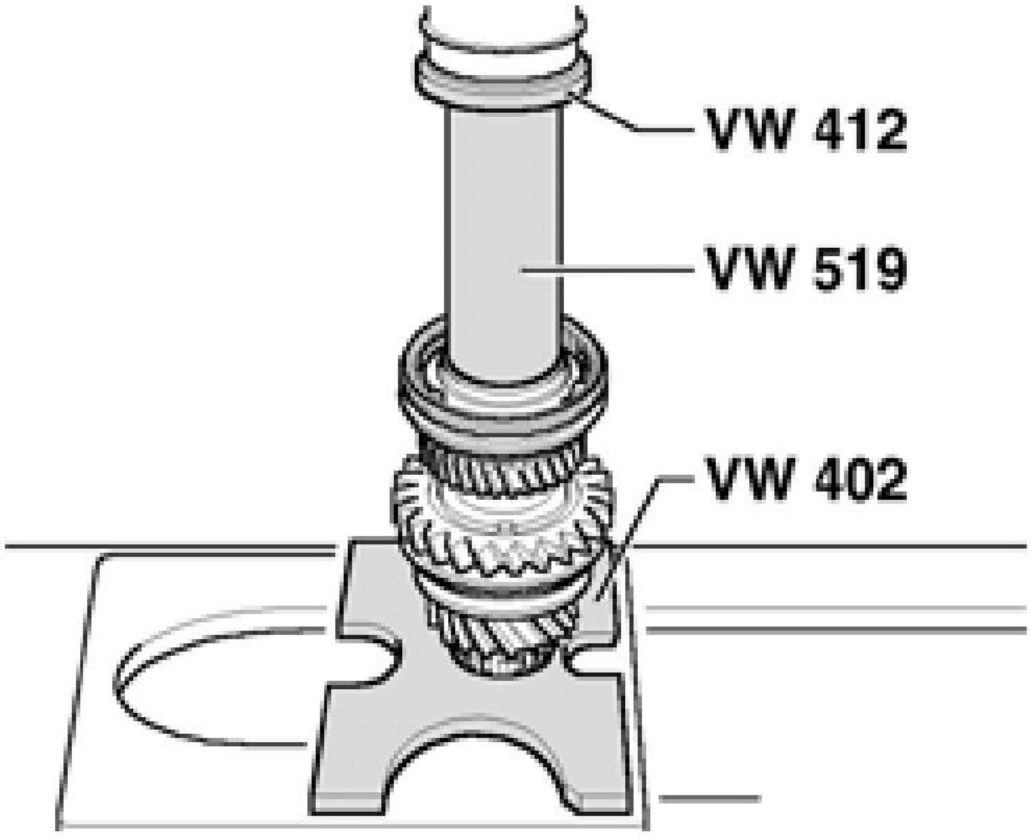


Fig. 143: Pressing On 5th And 6th Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Positioning spacer sleeve toward 5th gear locking collar/synchro-hub

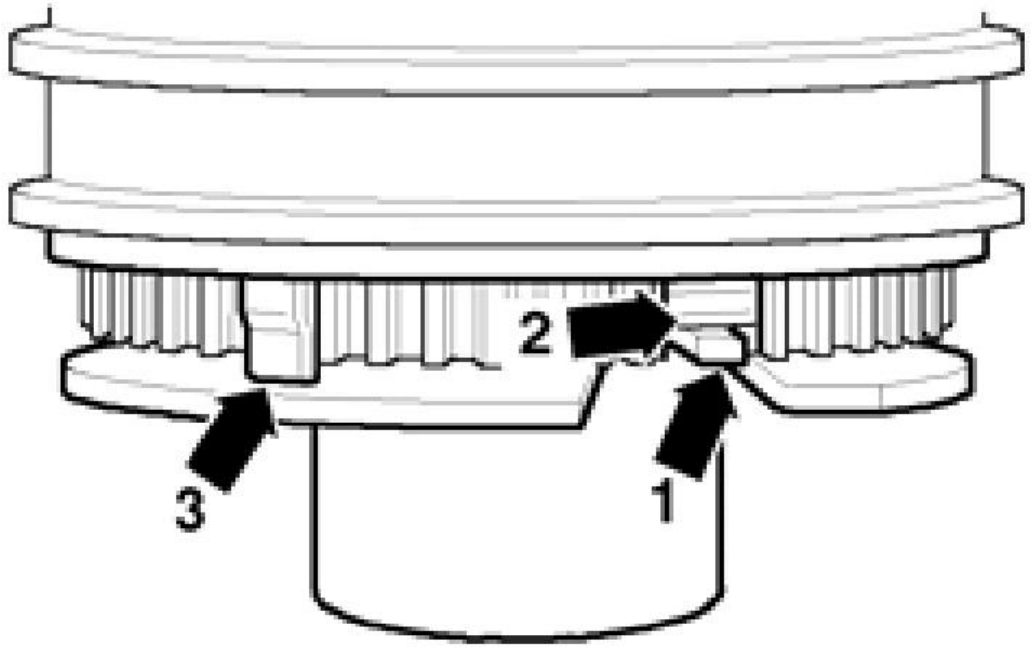


Fig. 144: Positioning Spacer Sleeve Toward 5th Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Lugs (arrow -1-) of spacer sleeve must line up with recesses in synchro-hub (arrow -2-).

Lock pieces (arrow -3-) must rest on collar of spacer sleeve.

Pressing on 5th gear locking collar/synchro-hub together with spacer sleeve

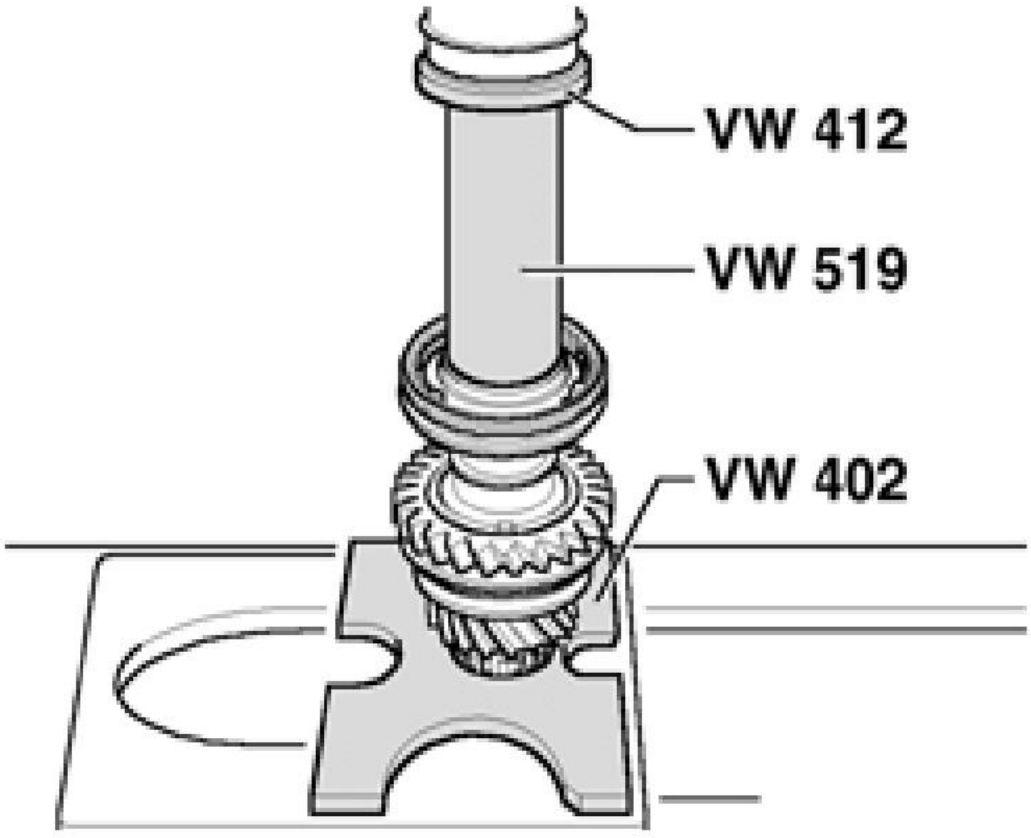


Fig. 145: Pressing On 5th Gear Locking Collar/Synchro-Hub Together With Spacer Sleeve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing on tapered roller bearing inner race

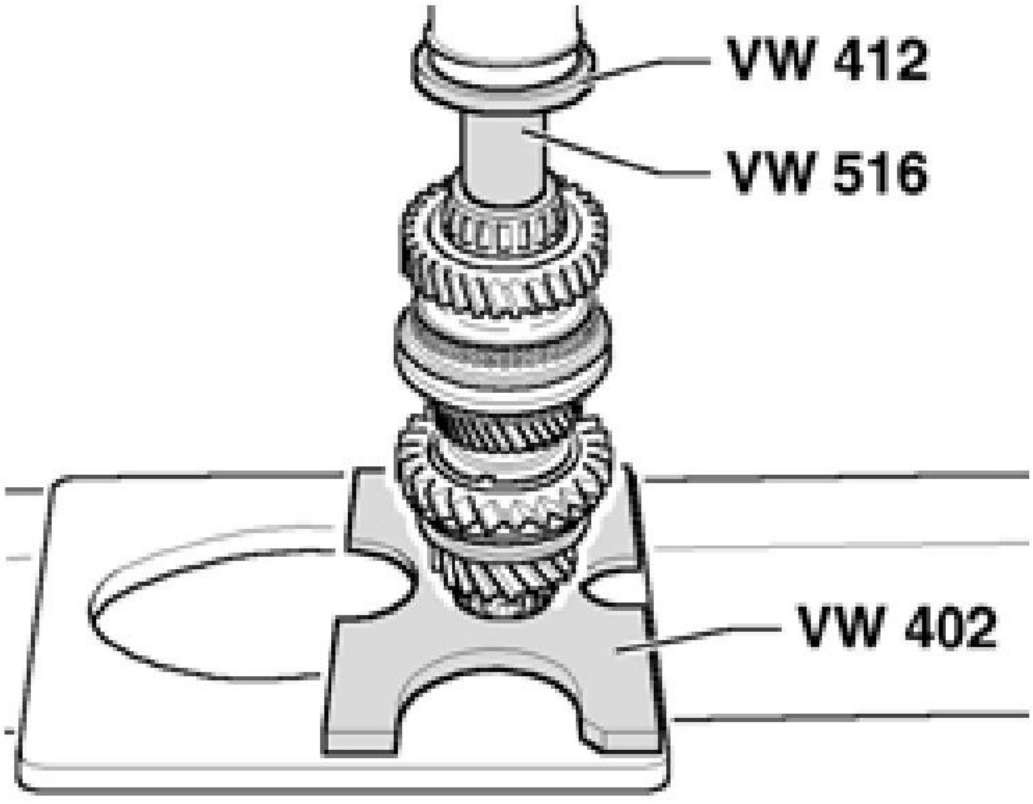


Fig. 146: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Determining thickness of circlip

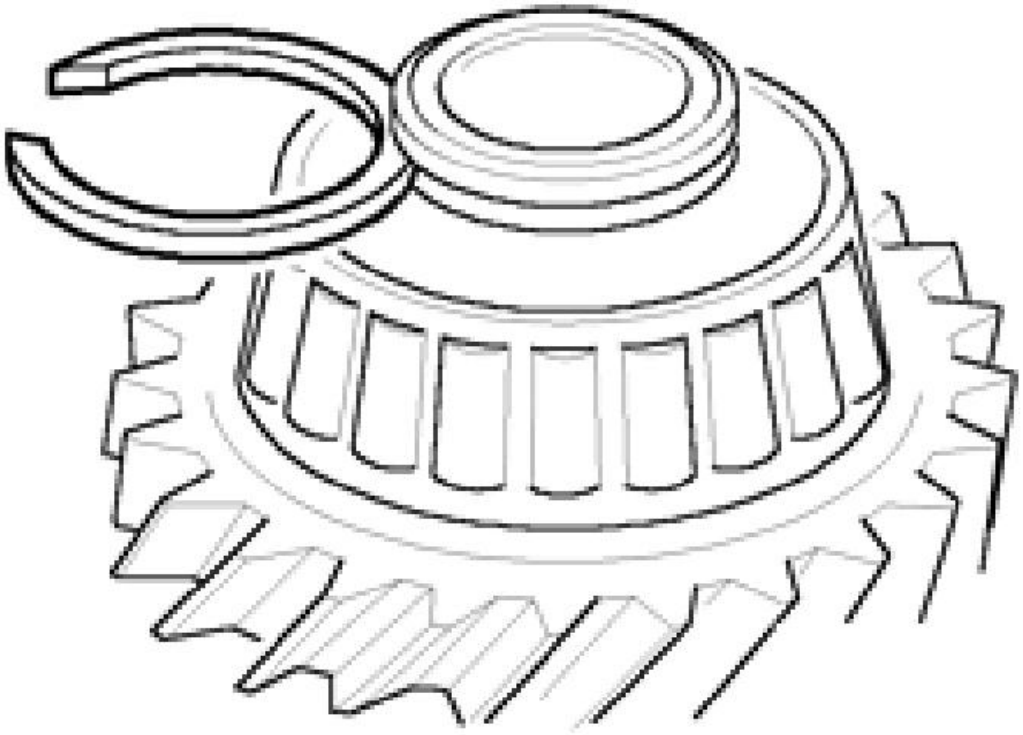


Fig. 147: Determining Thickness Of Circlip
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Determine thickest circlip which will still fit and install it.

The following securing clips are available:

SECURING CLIPS THICKNESS SELECTION (OUTPUT SHAFT FOR 5TH, 6TH AND REVERSE GEAR)

Thickness (mm)	Spare Part No.
1.79	02M 3111 187 G
1.83	02M 3111 187 F
1.86	02M 3111 187 E
1.89	02M 3111 187 D
1.92	02M 3111 187 C
1.95	02M 3111 187 B
1.98	02M 3111 187 A

Pressing on tapered roller bearing inner race

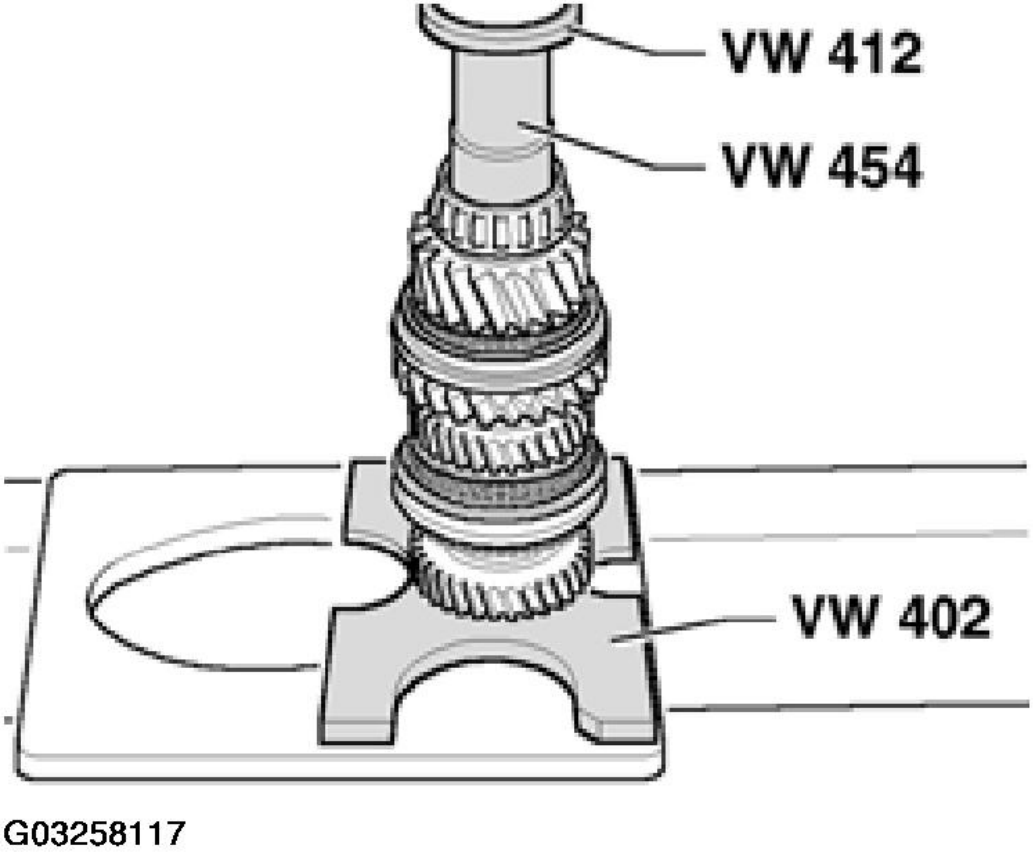


Fig. 148: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling tapered roller bearing outer race out of transmission housing

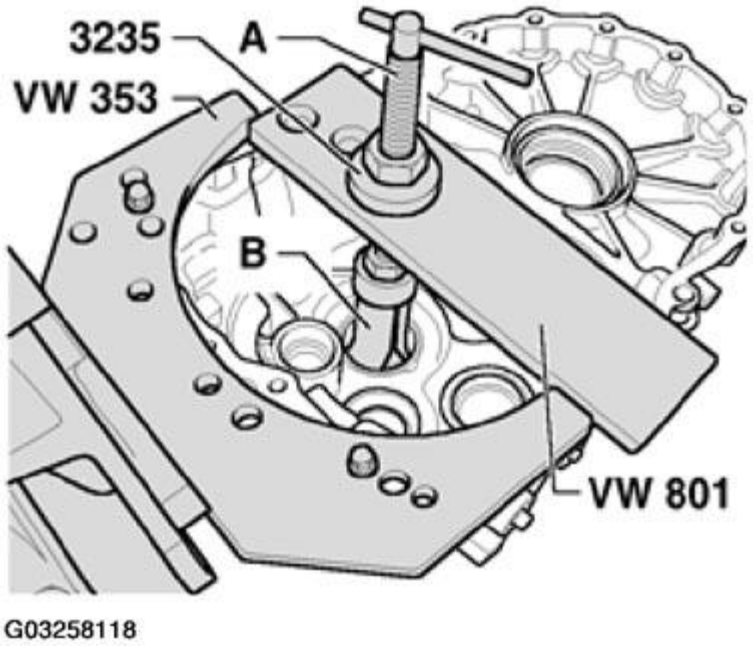


Fig. 149: Pulling Tapered Roller Bearing Outer Race Out Of Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Counter support, e.g. Kukko 22/2
B. Internal puller 46 to 58 mm, e.g. Kukko 21/7

Pressing tapered roller bearing outer race into transmission housing

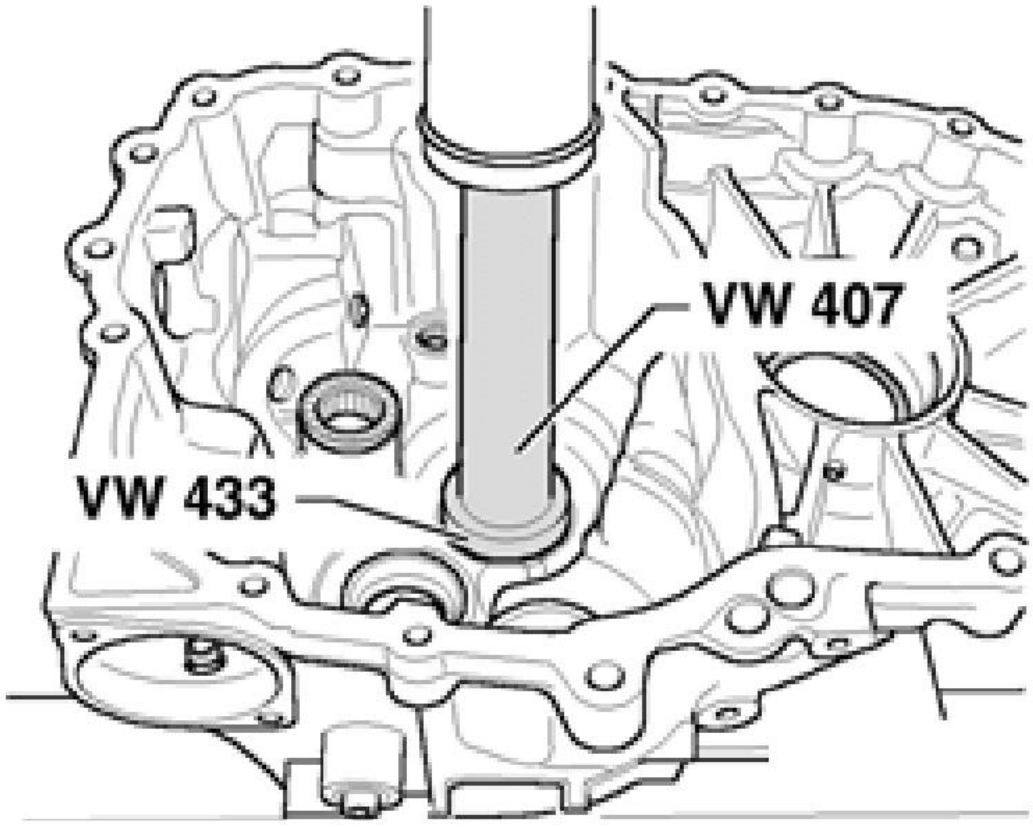


Fig. 150: Pressing Tapered Roller Bearing Outer Race Into Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Support transmission housing with press piece 2050 directly below bearing support.

OUTPUT SHAFT FOR 5TH, 6TH AND REVERSE GEAR, ADJUSTING

(Determining shim for output shaft)

Special tools and workshop

- VW 353 Transmission support
- VW 387 Universal dial gauge bracket
- VW 407 Press tool
- VW 433 Press piece

- VW 792 Installation tool
- VW 801 Holding plate

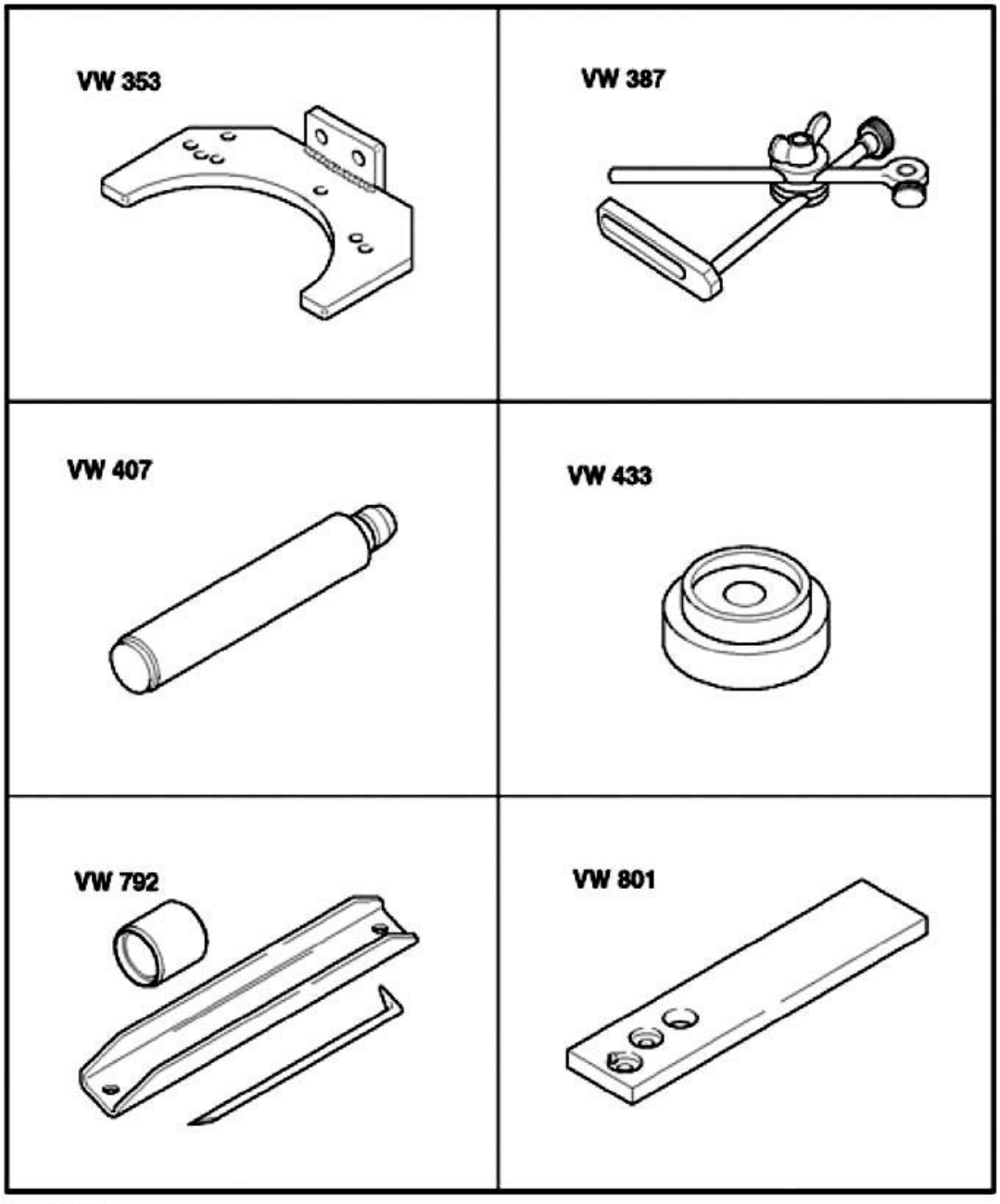
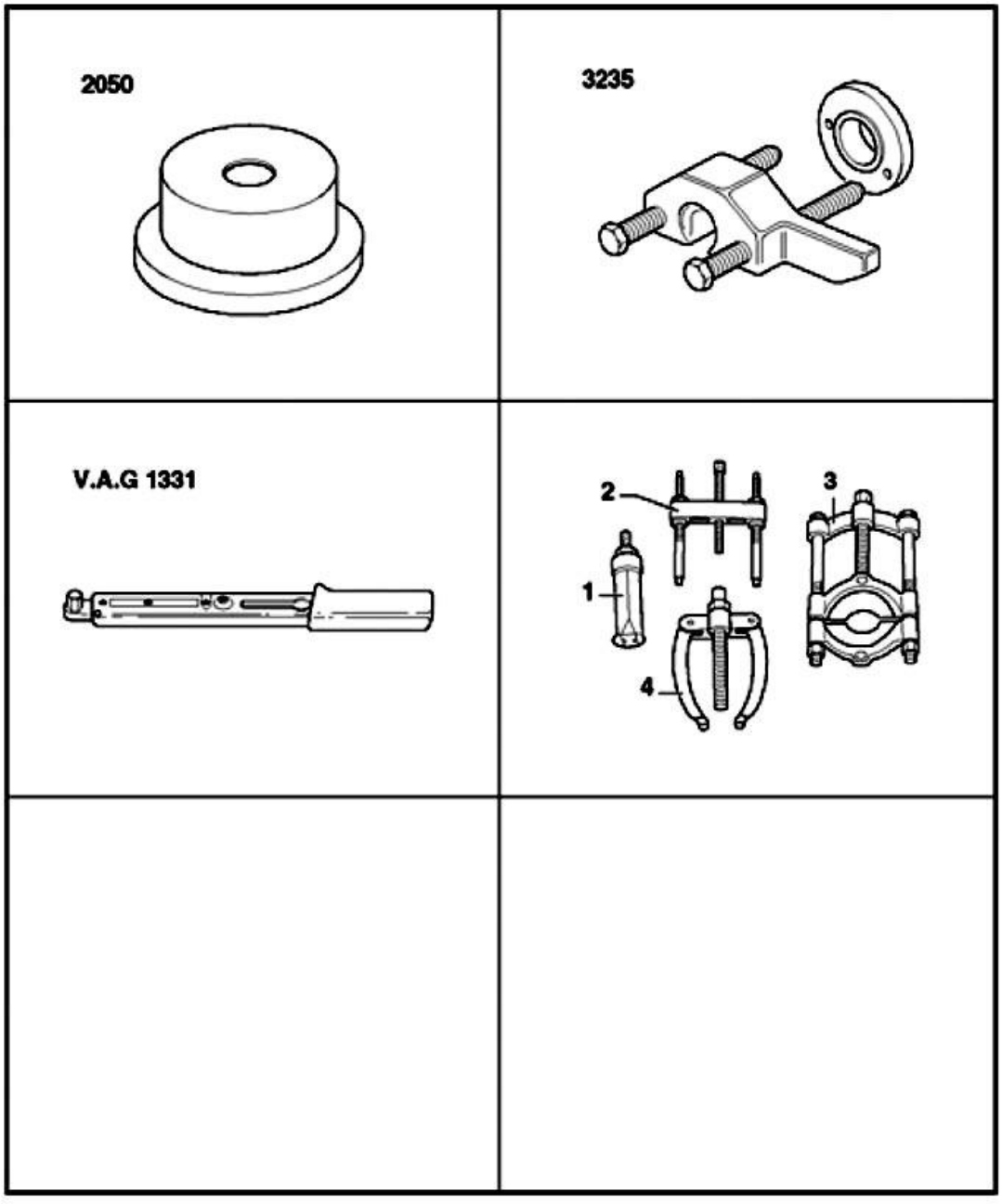


Fig. 151: Identifying Special Tools And Workshop (1 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 2050 Thrust piece
- 3235 Press
- V.A.G 1331 Torque wrench
- 1 - Kukko 21/7 Internal puller
- 4 - Kukko 22/2 Counter support



G03258121

Fig. 152: Identifying Special Tools And Workshop (2 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

It is necessary to readjust the output shaft when the following components are replaced:

- Transmission housing
- Clutch housing
- Output shaft for 5th, 6th and reverse gears

  or

- Tapered roller bearing

  Adjustment overview. See **Adjustment overview** .

Requirements

- Sealing surfaces of clutch and transmission housings must be free of sealant.
- When taking measurements, install only the shaft to be measured.
- Press tapered roller bearing outer race with a 1.70 mm thick shim into transmission housing, supporting housing directly under bearing support with thrust piece 2050.

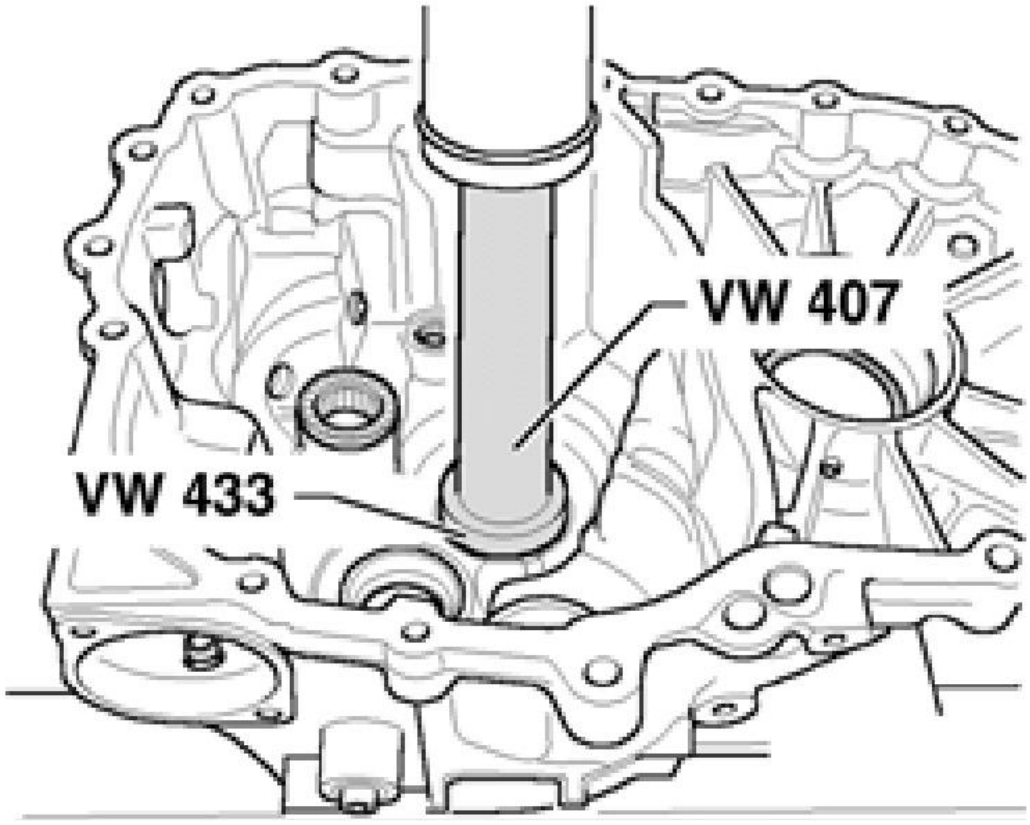


Fig. 153: Pressing Tapered Roller Bearing Outer Race With Shim Into Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Set complete 5th, 6th and reverse gear output shaft in clutch housing.
- Fit transmission housing and tighten bolts -A- and -B- diagonally to correct torque.

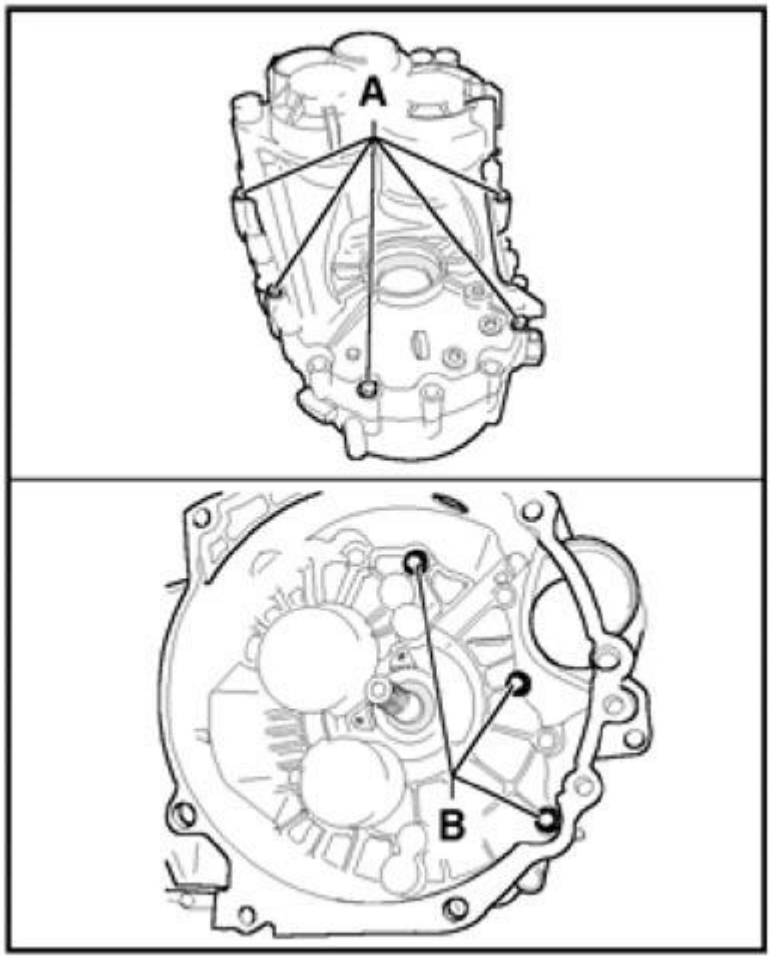


Fig. 154: Fitting Transmission Housing And Tightening Bolts -A- And -B- Diagonally To Correct Torque
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install measuring tools. Put washers with a total thickness of 8 mm on bolt -arrow- securing installation tool VW 792 to clutch housing.

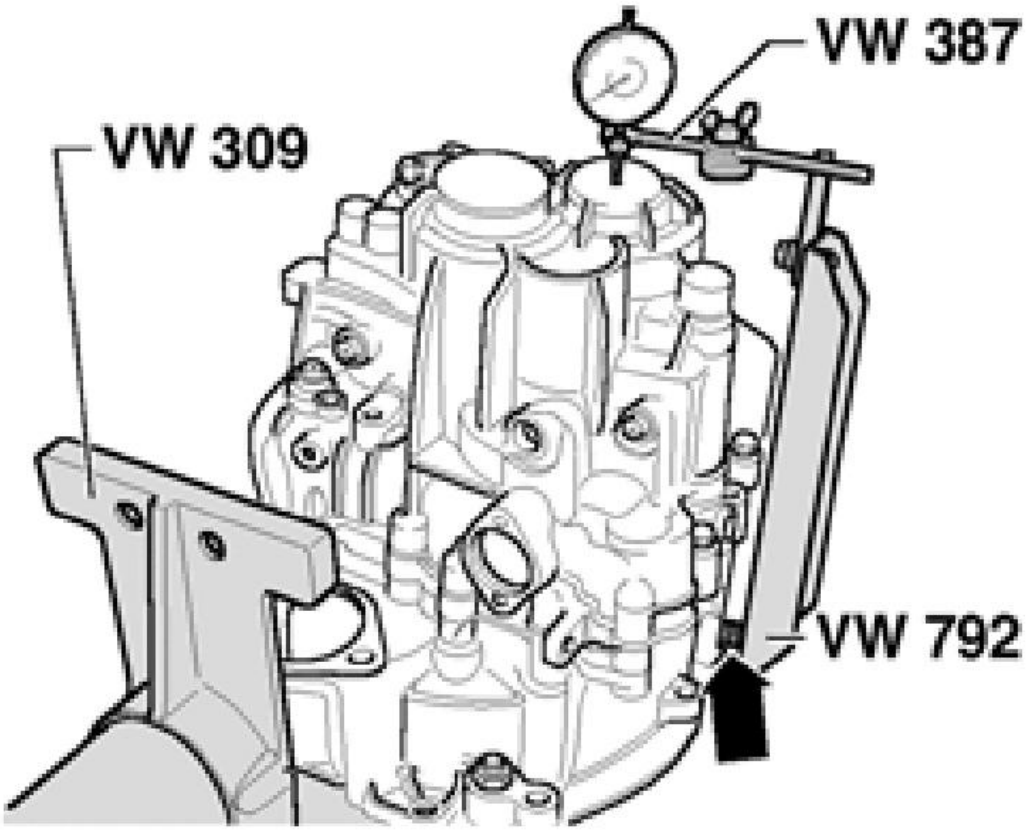


Fig. 155: Installing Measuring Tools
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Set dial gauge (3 mm measuring range) to zero with 1 mm preload.
- Loosen clutch housing/transmission housing securing bolts diagonally until output shaft moves freely in transmission housing.
- Read play on gauge and note reading (Example: 0.27 mm)

NOTE: If dial gauge indicates no value when clutch housing/transmission housing securing bolts are loosened, install shim 1.95 mm (Part No. 084 409 383 AS) or, if necessary, shim 2.20 mm (Part No. 084 409 383 BD).

Determining thickness of shim

The specified bearing pretension will be attained by subtracting the measured value (0.27 mm) from the inserted

shim (1.70 mm) and adding a constant for pressing (0.20 mm).

Example:

DETERMINING SHIM THICKNESS (OUTPUT SHAFT FOR 5TH, 6TH AND REVERSE GEAR, EXAMPLE)

Inserted shim	1.70 mm
- Measured value	0.27 mm
+ Preloading (constant)	0.20 mm
Shim thickness	1.63 mm

- Determine thickness of shim from table. See **SHIM TABLE** .
- Remove transmission housing and pull tapered roller bearing outer race out of housing.
  A. Counter support, e.g. Kukko 22/2
  B. Internal puller 46 to 58 mm, e.g. Kukko 21/7

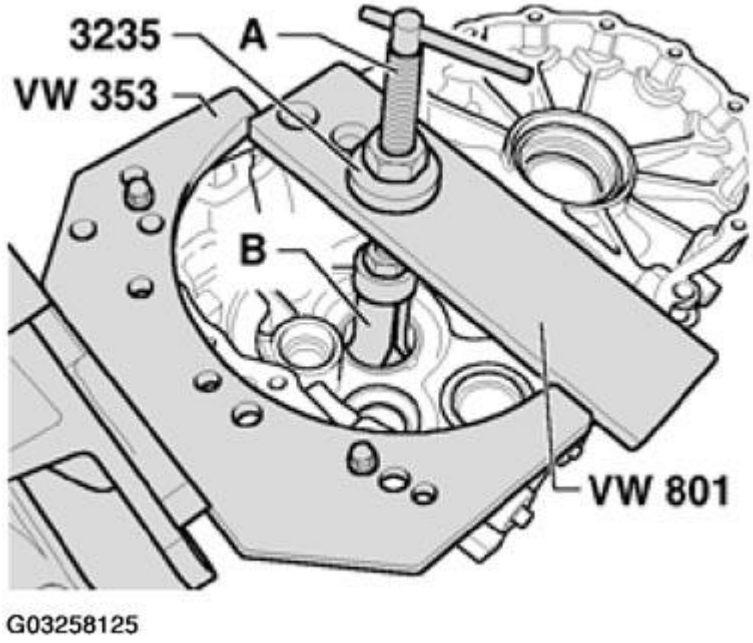


Fig. 156: Removing Transmission Housing And Pulling Tapered Roller Bearing Outer Race Out Of Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove inserted shim (1.70 mm thick) from clutch housing.

Shim table

SHIM SELECTION (OUTPUT SHAFT FOR 5TH, 6TH AND REVERSE GEAR)

Size (mm)	Part No.
1.40	084 409 383 AF
1.45	084 409 383 AG
1.50	084 409 383 AH
1.55	084 409 383 AJ
1.60	084 409 383 AK
1.65	084 409 383 AL
1.70	084 409 383 AM
1.75	084 409 383 AN
1.80	084 409 383 AP
1.85	084 409 383 AQ
1.90	084 409 383 AR
1.95	084 409 383 AS
2.00	084 409 383 AT
2.05	084 409 383 BA
2.10	084 409 383 BB
2.15	084 409 383 BC

Varying tolerances make it possible to obtain the exact shim thickness required.

- Press in tapered roller bearing outer race together with determined shim (in Example 1.65 mm) while supporting transmission housing with thrust piece 2050 directly under bearing support.

Perform check measurement

- Determined shim installed.
  - Install measuring tools. Put washers with a total thickness of 8 mm on bolt -arrow- securing installation tool VW 792 to clutch housing.

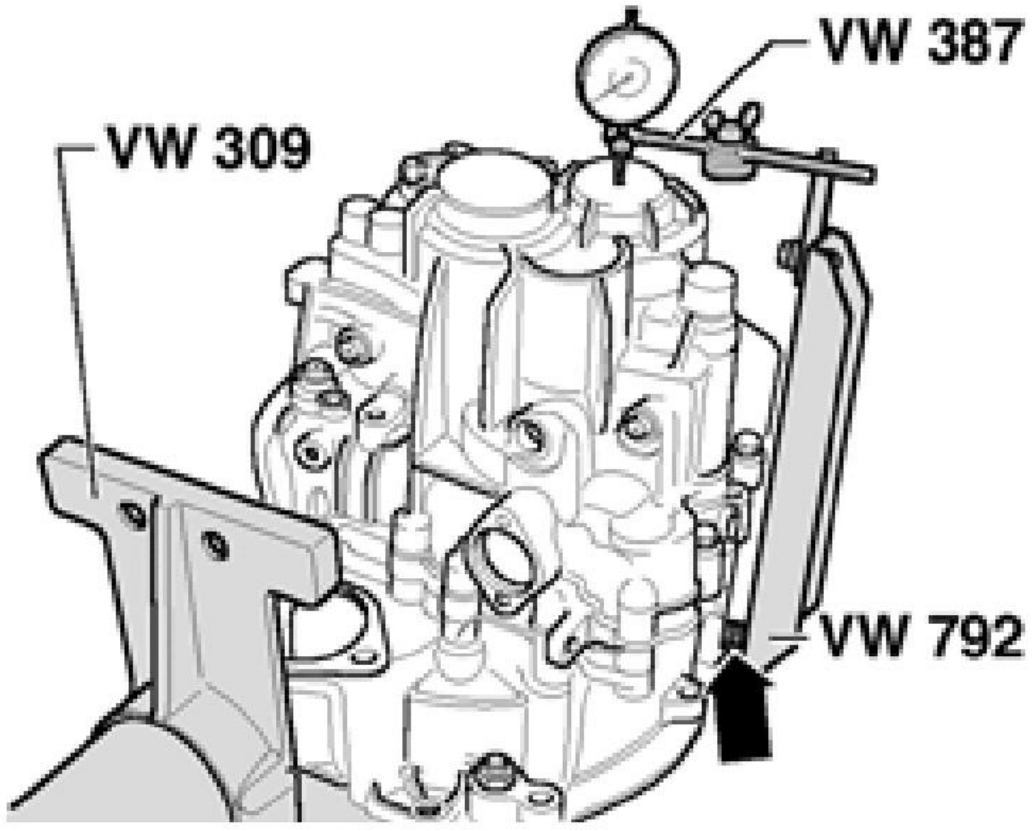


Fig. 157: Install Measuring Tools
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Set dial gauge (3 mm measuring range) to zero with 1 mm preload.
- Loosen clutch housing/transmission housing securing bolts diagonally until output shaft moves freely in transmission.
- If correct shim has been selected, dial gauge will indicate a value of 0.15 mm to 0.25 mm.

FINAL DRIVE, DIFFERENTIAL

OIL SEALS FOR FLANGED SHAFTS, REPLACING

Transmission in vehicle

Oil seal for left flanged shaft, replacing

Special tools and equipment

- VW 771 Multipurpose tool
- VW 771/37 Puller hooks
- 3303 Press piece
- V.A.G 1331 Torque wrench
- V.A.G 1332 Torque wrench

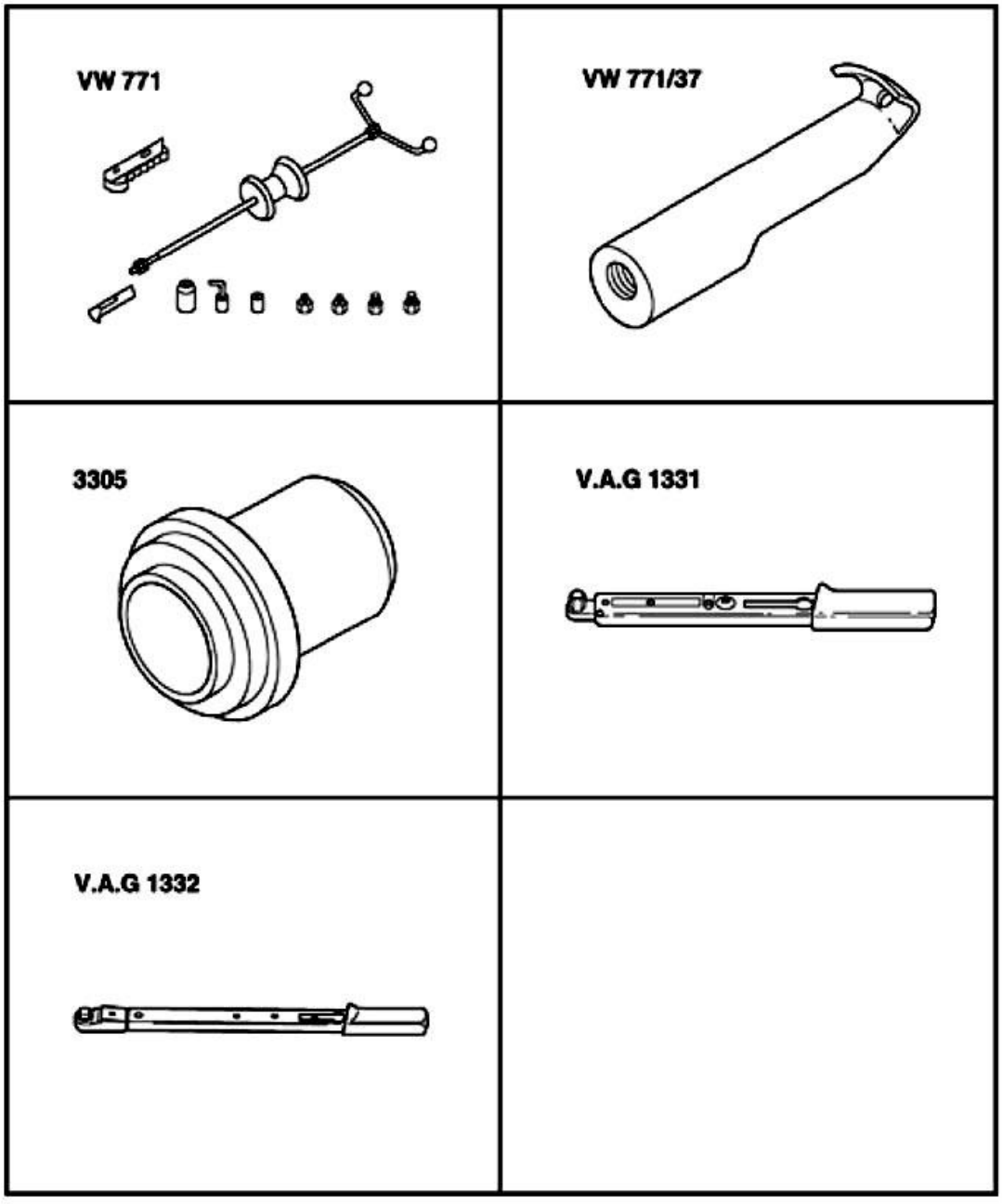


Fig. 158: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing

- Remove wheel.
- If fitted, remove center and left part of insulation tray below engine/transmission.

- Turn steering to left lock.
- Disconnect drive shaft from flanged shaft.
- Mark installation position of bolts -1-.
- Remove bolts -1-.

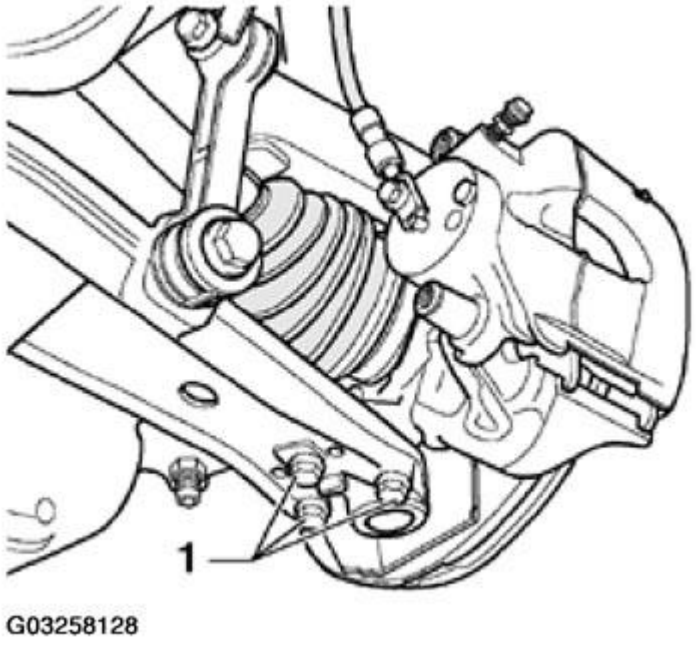


Fig. 159: Marking Installation Position Of Ball Joint Bolts
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Tie-up drive shaft as high as possible. Do not damage paint on drive shaft.
- Remove flanged shaft securing bolts by screwing two bolts into flange and counterhold flanged shaft using a lever.
- Place container under transmission.
- Remove flanged shaft with spring.
- Pull flanged shaft oil seal out using VW 771 and VW 771/37.

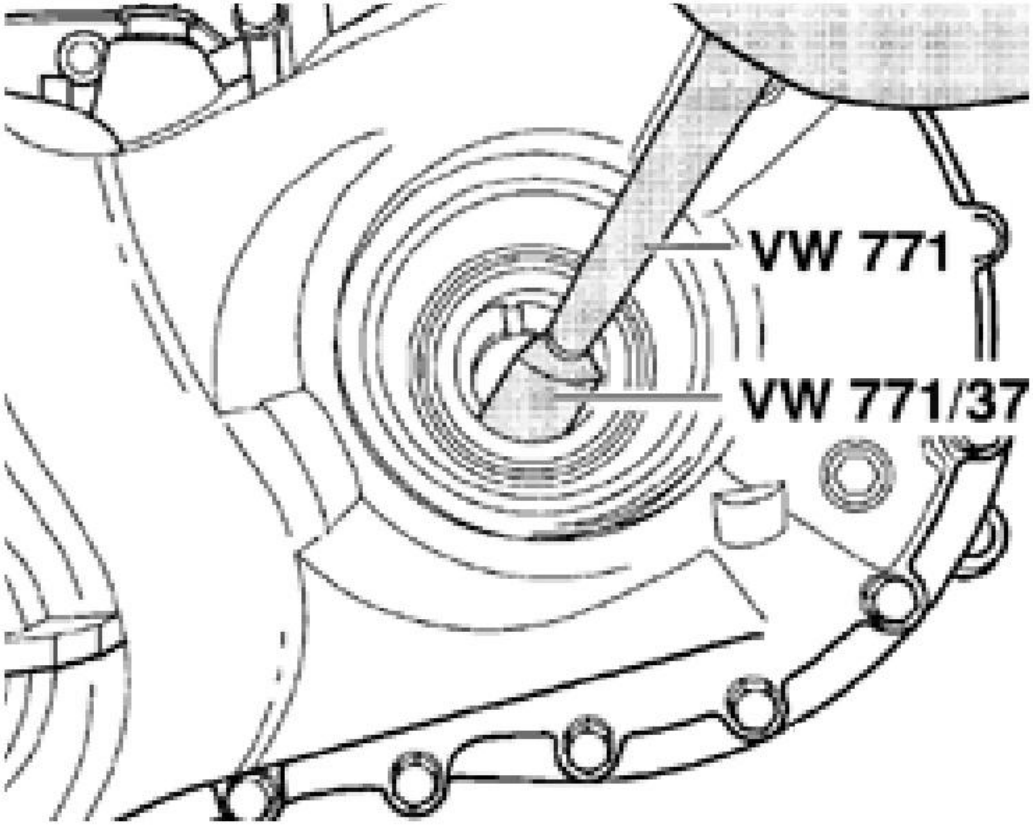


Fig. 160: Pulling Left Flanged Shaft Oil Seal Out Using VW 771 And VW 771/37
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Installing

- Drive new seal in onto stop, do not tilt seal when doing this.

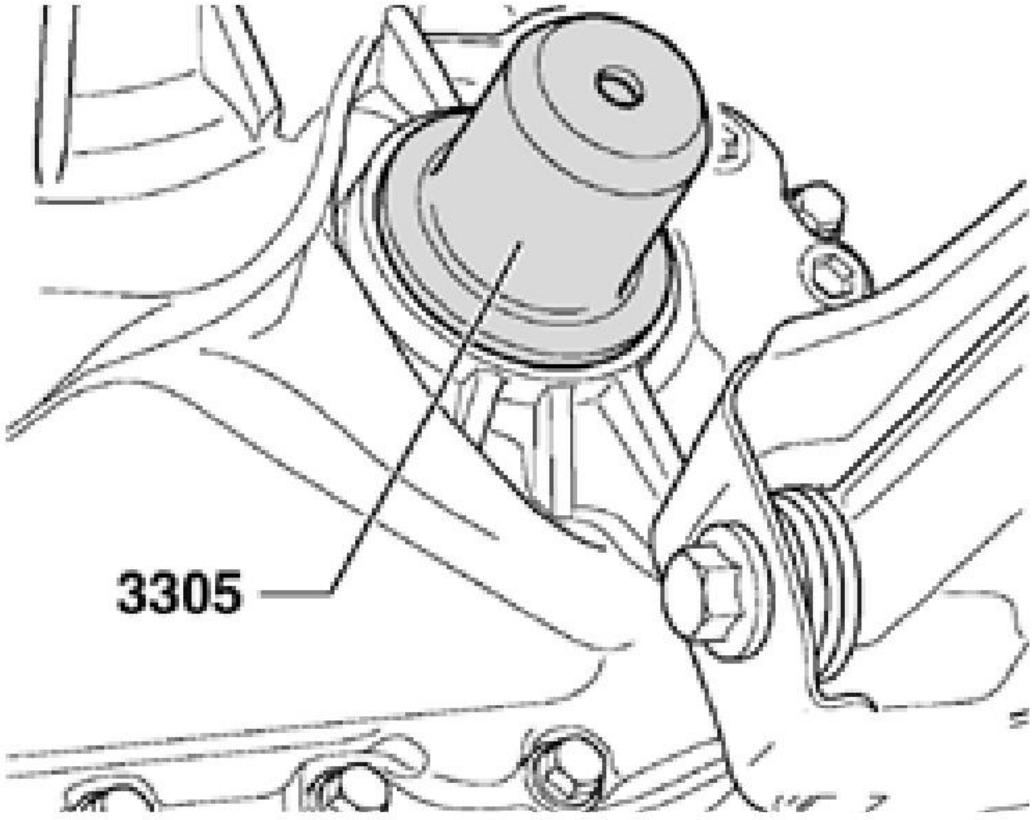


Fig. 161: Driving New Left Flanged Shaft Oil Seal Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Fill space between sealing lip and dust lip with grease G52 128 A1.
- Insert flanged shaft.
- Secure flange shaft with countersunk bolt.
- Connect ball joint to control arm using new bolts onto old impression marks.
- Bolt left-hand drive shaft to flanged shaft.

See **FRONT AXLE SHAFT**

- Install wheel.
- Check transmission oil. See **CHECKING FLUID LEVEL** .
- Install sound insulation tray.

Tightening torque

Flanged shaft to transmission (conical head bolt) 25 N.m

Oil seal for right flanged shaft, replacing

Special tools and equipment

- 3158 Drift sleeve
- V.A.G 1331 Torque wrench or equivalent
- V.A.G 1332 Torque wrench or equivalent

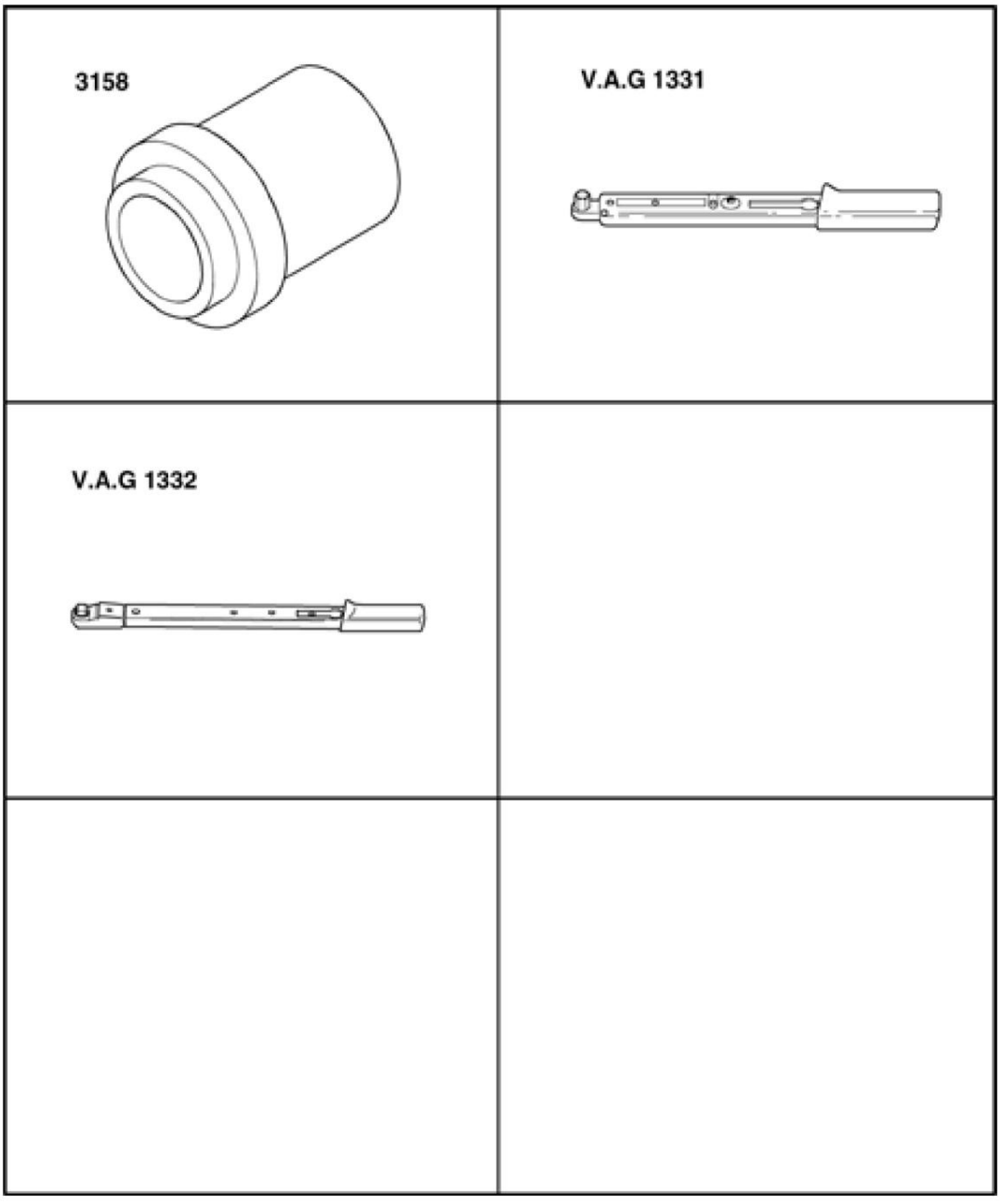


Fig. 162: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing

- If installed, remove center and right part of insulation tray below engine/transmission.
- Turn steering to right onto full lock stop.

- Remove drive shaft.

  See **FRONT AXLE SHAFT**

- Remove flanged shaft securing bolts by threading two bolts into flange and counterhold flanged shaft using a lever.
- Place container under transmission.
- Remove flanged shaft with spring.
- Pry seal out.

Installing

- Drive new seal in onto stop, do not tile seal when doing this.

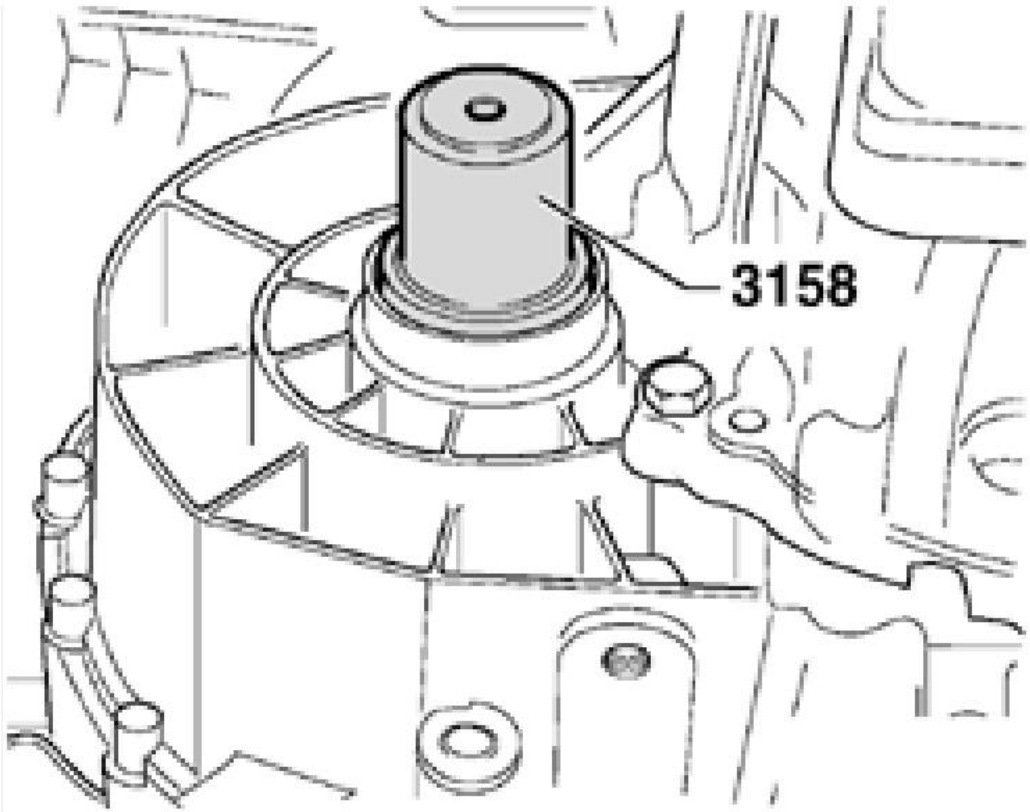


Fig. 163: Driving New Right Flanged Shaft Oil Seal Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Fill space between sealing lip and dust lip with grease G52 128 A1.
- Insert flanged shaft.
- Secure flange shaft with countersunk bolt.
- Install drive shaft.

  See **FRONT AXLE SHAFT**

- Check transmission oil. See **CHECKING FLUID LEVEL** .
- Install sound insulation tray.

Tightening torques

Flanged shaft to transmission (conical head bolt) 25 N.m

DIFFERENTIAL, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 353 Transmission support
- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Press tool
- VW 408 A Press tool
- VW 412 Press tool

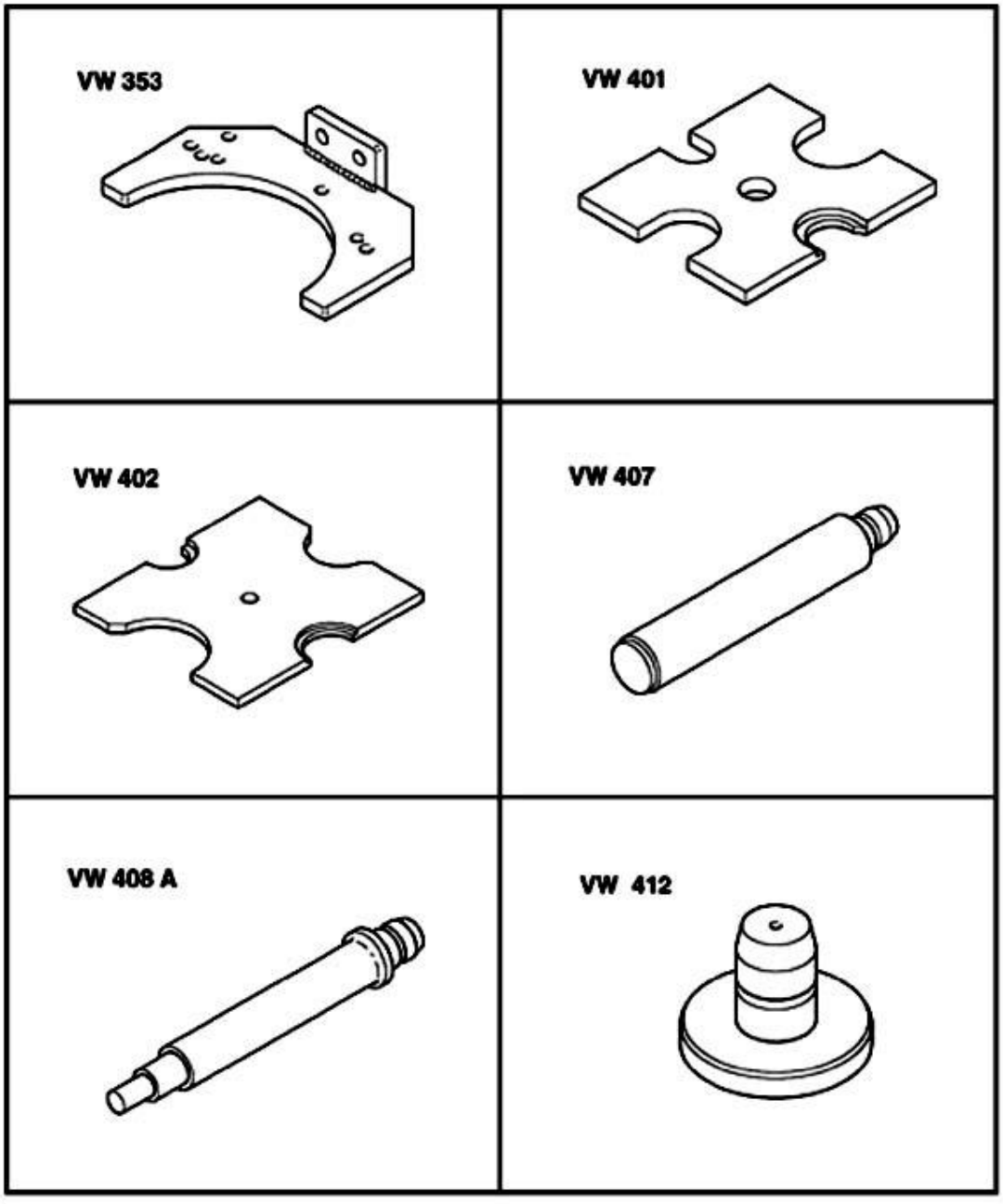


Fig. 164: Identifying Special Tools And Equipment (1 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 40-105 Thrust plate
- 3005 Press disk
- 3259 Tube

- 3296 Tube
- 3345 Tube
- V.A.G 1332 Torque wrench or equivalent

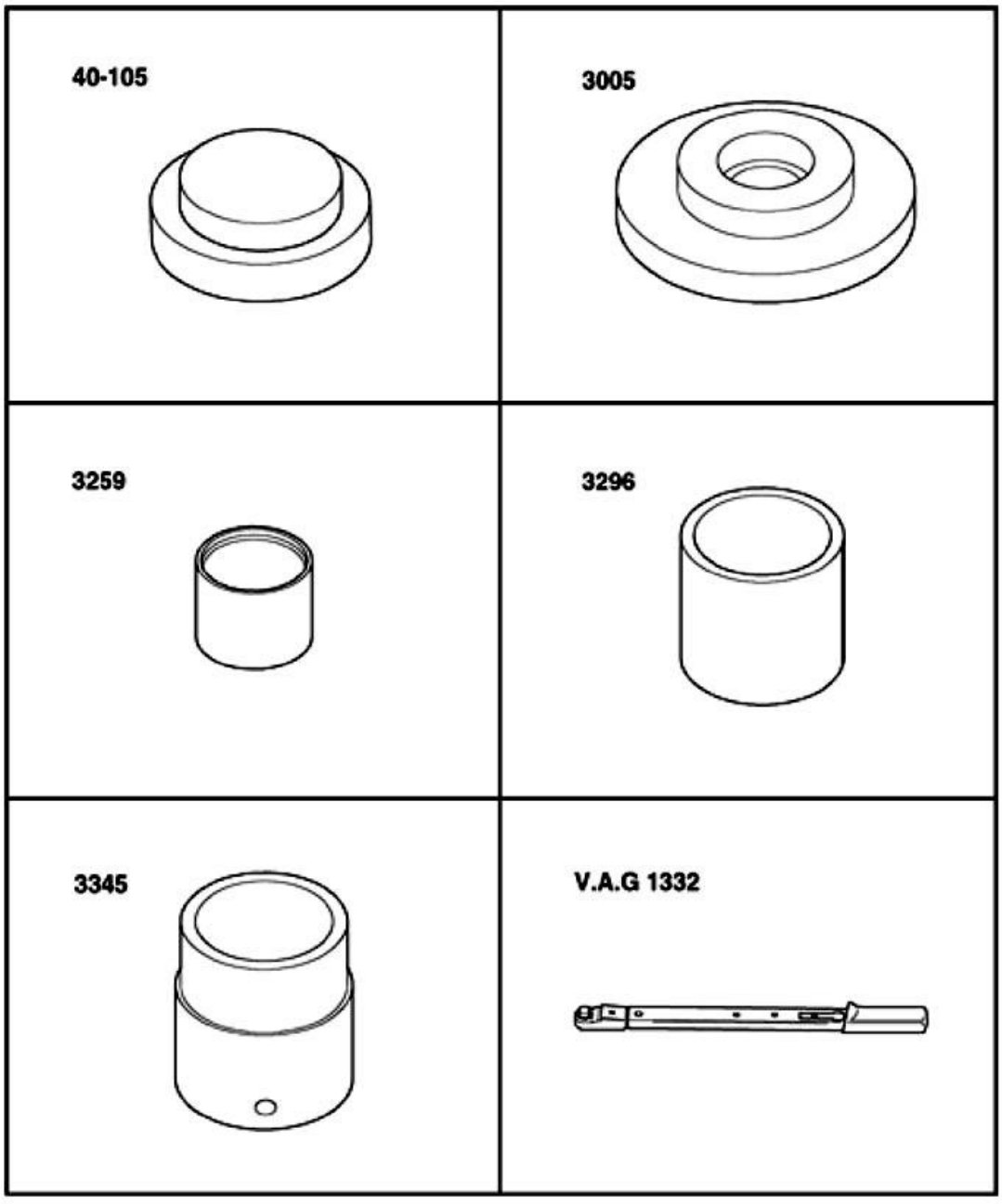


Fig. 165: Identifying Special Tools And Equipment (2 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- V.A.G 1582 Tapered roller bearing puller
- V.A.G 1582/6 Grip
- 1 -Kukko 21/7 Internal puller
- 4 - Kukko 22/2 Counter support

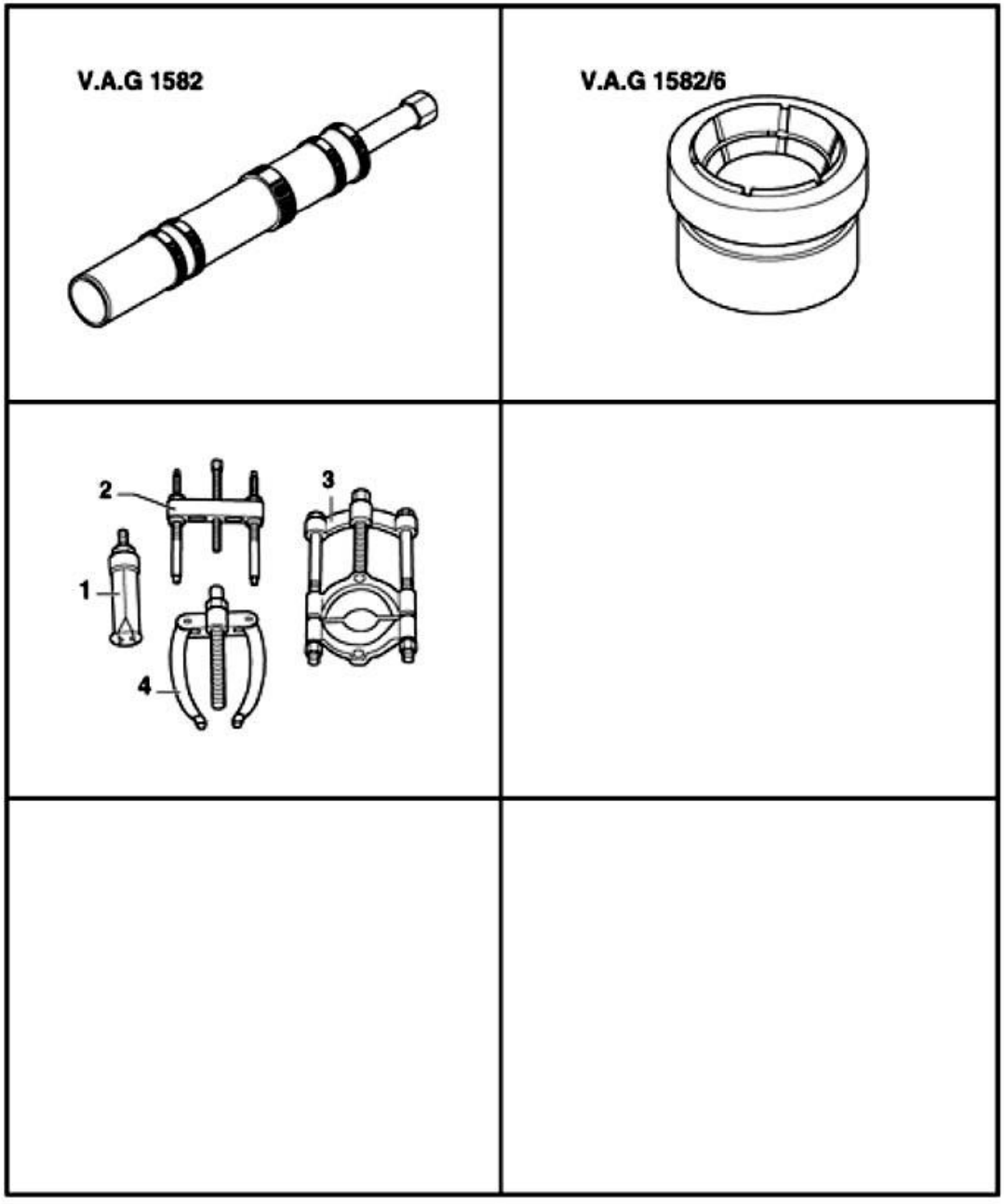


Fig. 166: Identifying Special Tools And Equipment (3 Of 3)

Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE:

- **Heat tapered roller bearing inner race to 100°C before installing.**
- **Always replace both tapered roller bearings together as a set.**
- **If tapered roller bearings, differential housing, transmission housing or clutch housing are replaced, adjust differential. See DIFFERENTIAL, ADJUSTING**

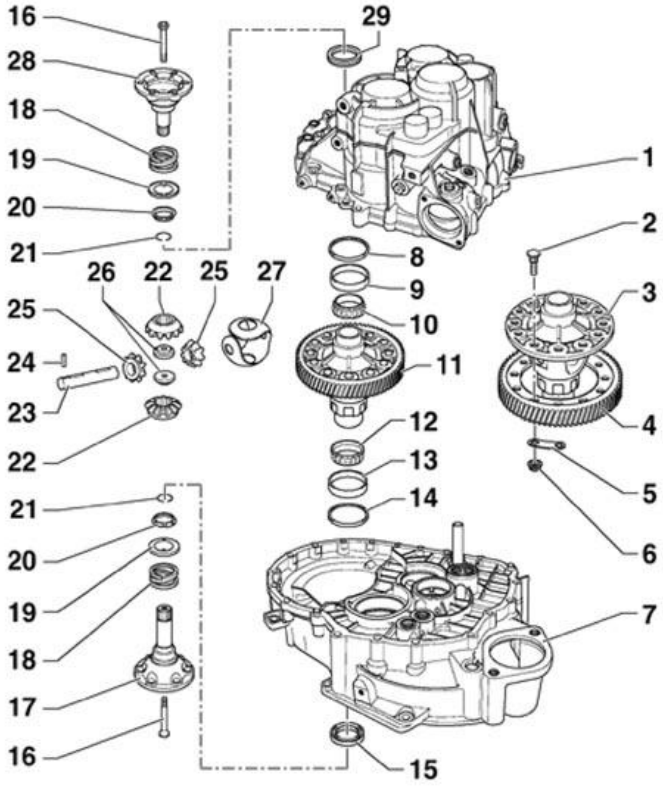
NOTE: The following list refers to items in Fig. 167 .

1. **Transmission housing**
2. **Bolt**
3. **Differential cage**
   - Bolt to final drive gear
4. **Final drive gear**
   - Rivited in production
   - Pressing off. See **Pressing off final drive gear**
   - Installation position: machined side faces toward bolting surface of differential housing
   - Heat to 100° C before installing
   - Fit to differential housing. See **HEATING FINAL DRIVE GEAR TO APPROX. 100° C and installing** .
   - Bolted. See **Bolting final drive gear -A- and differential housing -B- together** .
5. **Backing plate**
6. **Nut, 40 N.m and turn 45 further**
7. **Clutch housing**
8. **Shim**
   - For differential
   - Determining thickness. See **DIFFERENTIAL, ADJUSTING**
9. **Tapered roller bearing outer race**
   - Pulling out. See **Pulling tapered roller bearing outer race out of transmission housing** .
   - Pressing in. See **Pressing tapered roller bearing outer race into transmission housing** .
10. **Tapered roller bearing inner race**
    - Pulling off. See **Pulling off tapered roller bearing inner race** .
    - Pressing on **Pressing on tapered roller bearing inner race** .
11. **Differential housing**
    - With riveted final drive gear
    - When replacing final drive gear drill out rivet heads. See **Drilling out rivet heads**
    - Attaching final drive gear with bolts. See **Bolting final drive gear -A- and differential housing -B- together** .

12. **Tapered roller bearing inner race**
    - Pulling off. See **Pulling off tapered roller bearing inner race** .
    - Pressing on **Pressing on tapered roller bearing inner race** .
13. **Tapered roller bearing outer race**
    - Pulling out. See **Pulling tapered roller bearing outer race out of clutch housing** .
    - Pressing in. See **Pressing tapered roller bearing outer race into clutch housing** .
14. **Shim**
    - Always 0.65 mm thick
15. **Oil seal**
    - For right-hand flanged shaft
    - Left and right-hand diameters differ.
    - Replacing with transmission installed. See **OIL SEALS FOR FLANGED SHAFTS, REPLACING** .
16. **Counter-sunk head bolt, 25 N.m**
    - Bolt into threaded piece (item - 26 -)
17. **Left-hand flange shaft**
    - Do not interchange, left and right-hand flange shafts differ
18. **Spring for flanged shaft**
    - Installed behind flanged shafts
19. **Thrust washer**
    - Installation position: shoulder toward spring, tongue to tapered ring
20. **Tapered ring**
    - With grooves to secure thrust washer
    - Installation position: Taper toward differential housing
21. **Securing clip**
    - Ensures that taper ring, thrust washer and spring are held in position when flange shaft is removed
22. **Large differential bevel gear**
    - Installing. See **Installing differential bevel gears** .
23. **Differential bevel gear shaft**
    - Knock out with drift
    - Installing. See **Installing differential bevel gears** .
24. **Spring pin**
    - For securing differential bevel gear shaft
    - Removing and installing. See **Removing and installing differential bevel gear shaft spring pin** .
25. **Small differential bevel gear**
    - Installing. See **Installing differential bevel gears** .
26. **Threaded piece**

- Installing. See **Installing differential bevel gears** .

27. **One-piece thrust washer**
    - Coat with transmission oil when installing
28. **Left-hand flanged shaft**
    - Do not interchange, left and right-hand flange shafts differ
29. **Oil seal**
    - For left-hand flanged shaft
    - Left and right-hand diameters differ.
    - Replacing with transmission installed. See **OIL SEALS FOR FLANGED SHAFTS, REPLACING** .



1 - Transmission housing
2 - Bolt
3 - Differential cage
4 - Final drive gear
5 - Backing plate
6 - Nut, 40 Nm and turn 45° further
7 - Clutch housing
8 - Shim
9 - Tapered roller bearing outer race
10 - Tapered roller bearing inner race
11 - Differential housing
12 - Tapered roller bearing inner race
13 - Tapered roller bearing outer race
14 - Shim
15 - Oil seal
16 - Counter-sunk head bolt, 25 Nm
17 - Left-hand flange shaft
18 - Spring for flanged shaft
19 - Thrust washer
20 - Tapered ring
21 - Securing clip
22 - Large differential bevel gear
23 - Differential bevel gear shaft
24 - Spring pin
25 - Small differential bevel gear
26 - Threaded piece
27 - One-piece thrust washer
28 - Left-hand flanged shaft
29 - Oil seal

G03258136

Fig. 167: Disassembling And Assembling Differential
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling tapered roller bearing outer race out of clutch housing

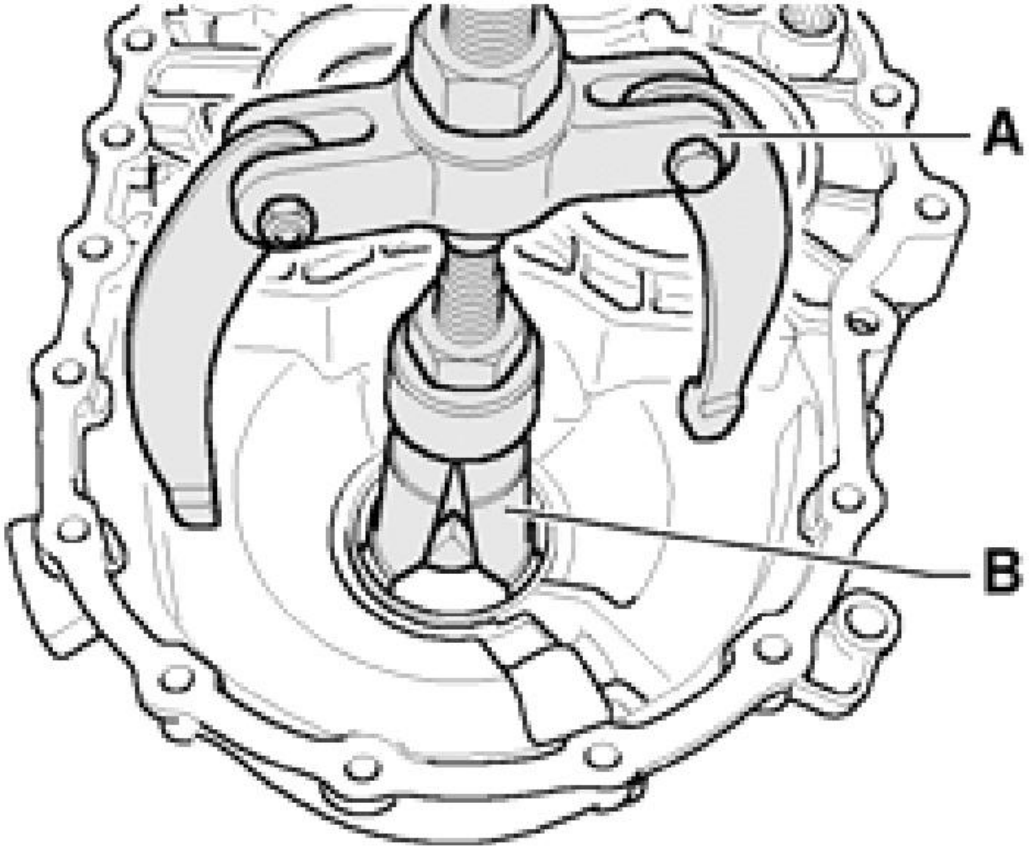


Fig. 168: Pulling Tapered Roller Bearing Outer Race Out Of Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Counter support, e.g. Kukko 22/2
B. Internal puller 46 to 58 mm, e.g. Kukko 21/7

NOTE: After pressing out, check washer for damage and replace if necessary.

Pressing tapered roller bearing outer race into clutch housing

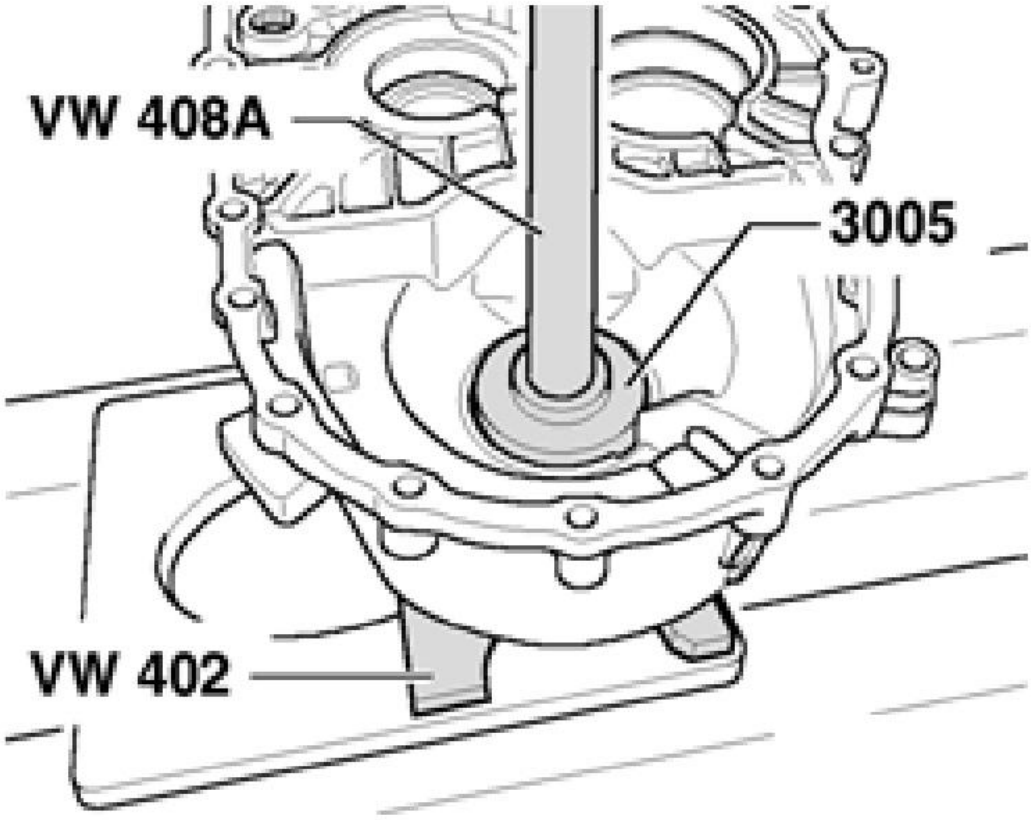


Fig. 169: Pressing Tapered Roller Bearing Outer Race Into Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- First insert washer.

Pulling off tapered roller bearing inner race

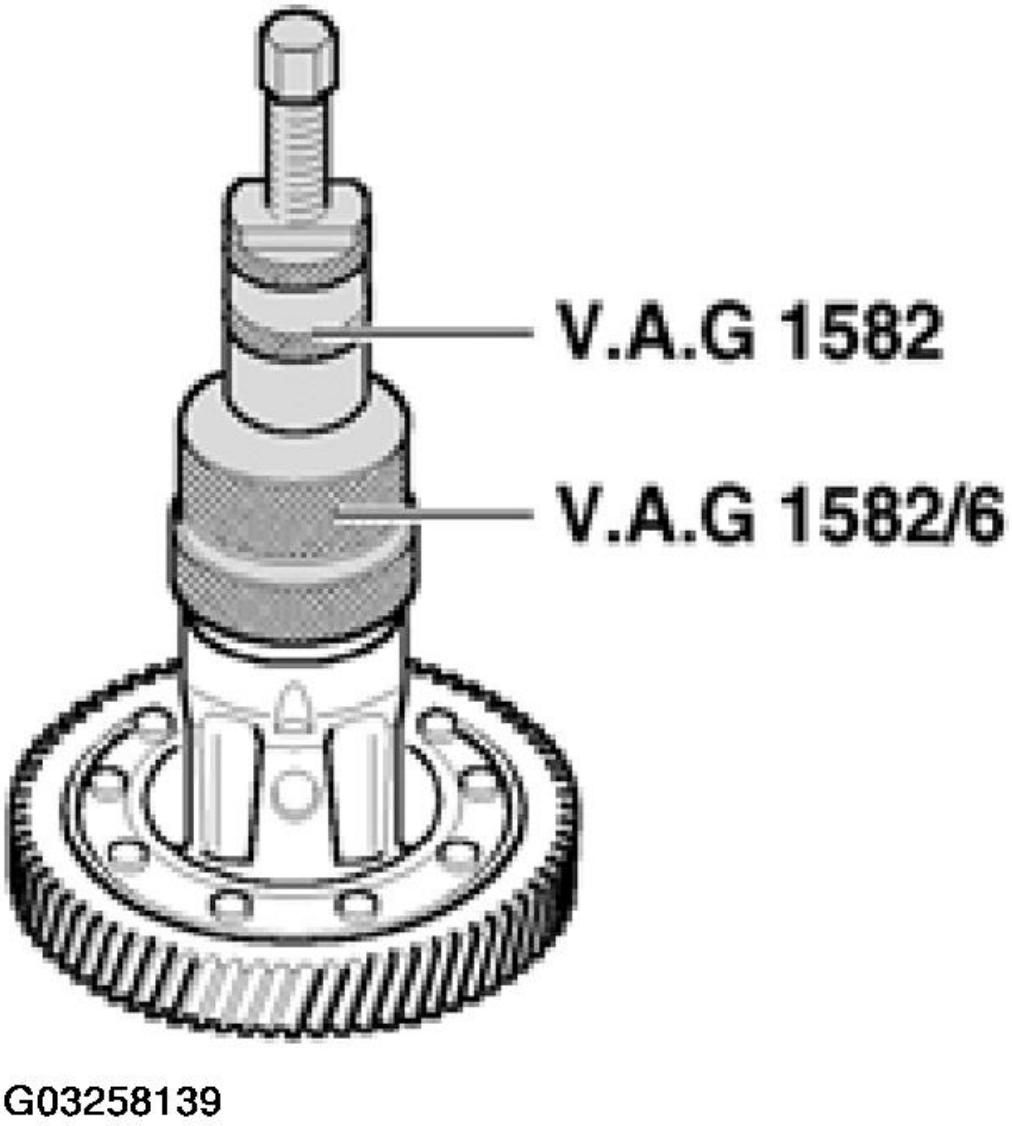


Fig. 170: Pulling Off Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Before mounting extractor position press piece 40-105 on differential housing.

NOTE: Both tapered roller bearing inner races are pulled off the differential housing in the same way.

Pressing on tapered roller bearing inner race

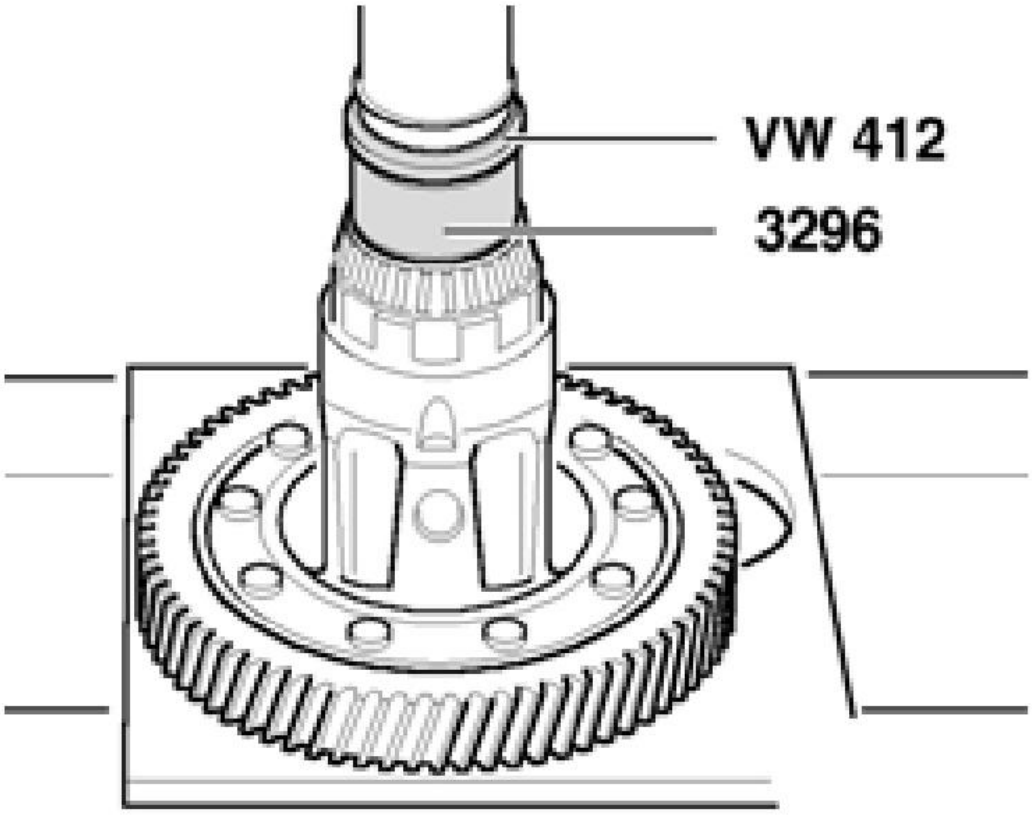


Fig. 171: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The tapered roller bearing inner races for transmission housing and clutch housing are pressed on with the same press tools.

Pulling tapered roller bearing outer race out of transmission housing

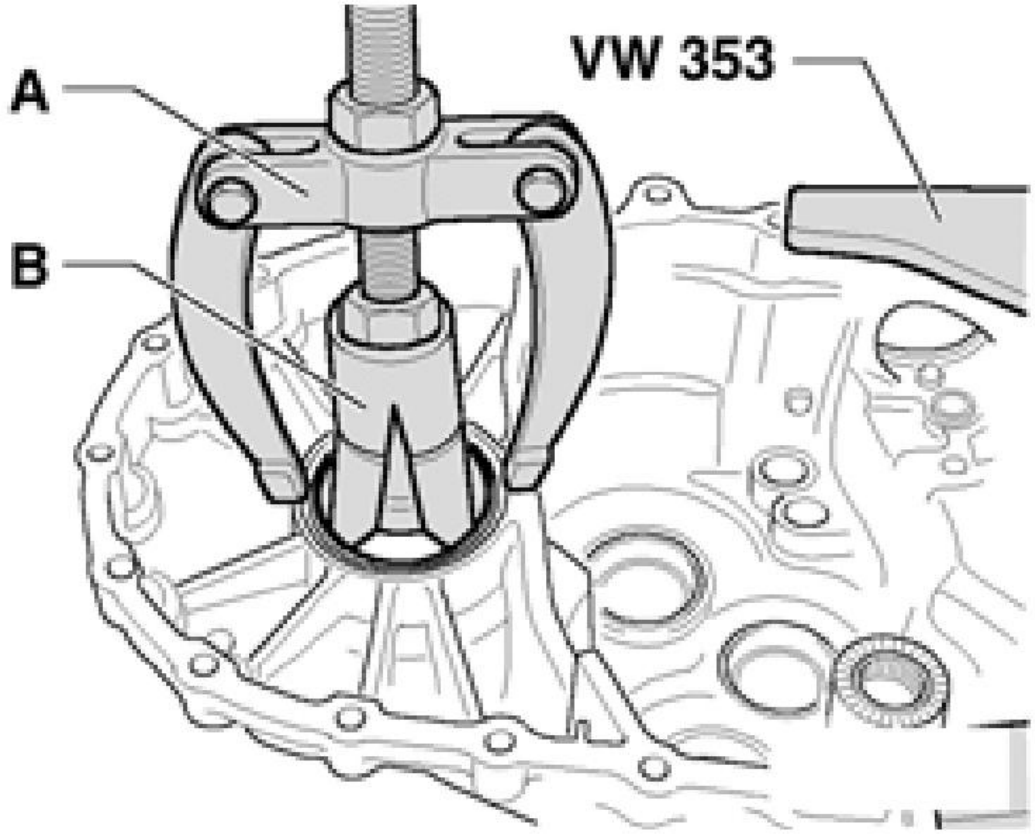


Fig. 172: Pulling Tapered Roller Bearing Outer Race Out Of Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Counter support, e.g. Kukko 22/2
B. Internal puller 46 to 58 mm, e.g. Kukko 21/7

Pressing tapered roller bearing outer race into transmission housing

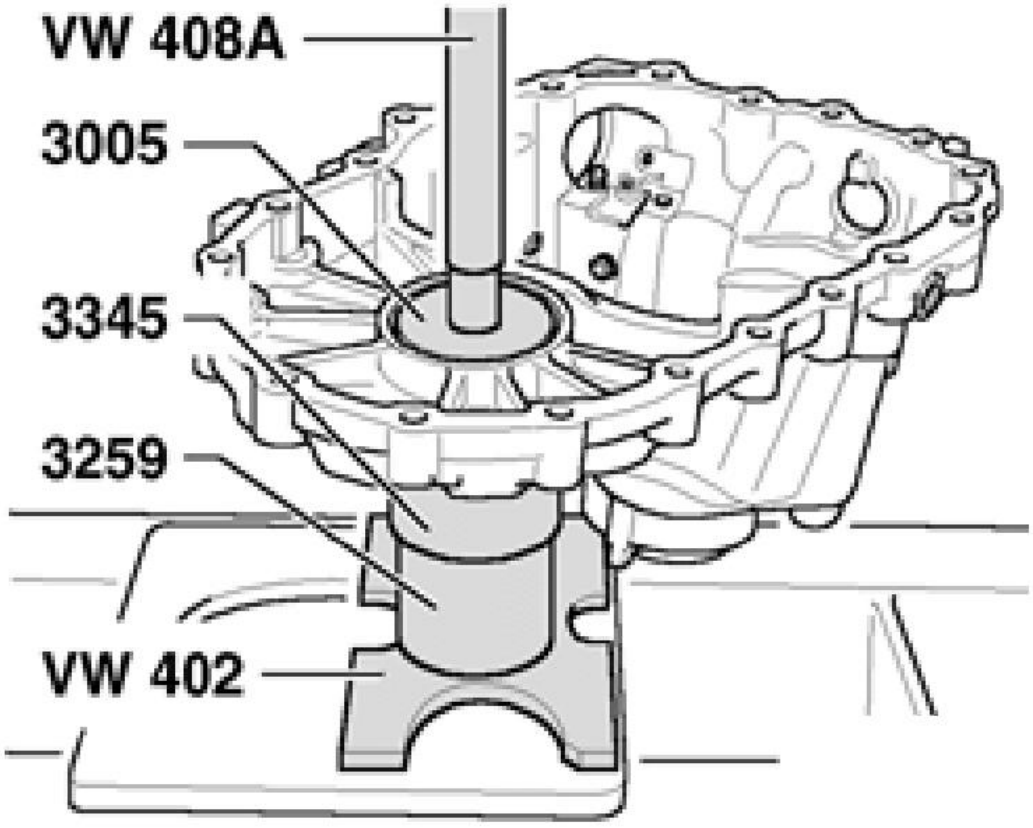


Fig. 173: Pressing Tapered Roller Bearing Outer Race Into Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Support transmission housing with tube 3345 directly below bearing mounting.

Drilling out rivet heads

- Drill out rivet heads with 12 mm drill from countersunk side and drive rivet out with drift.

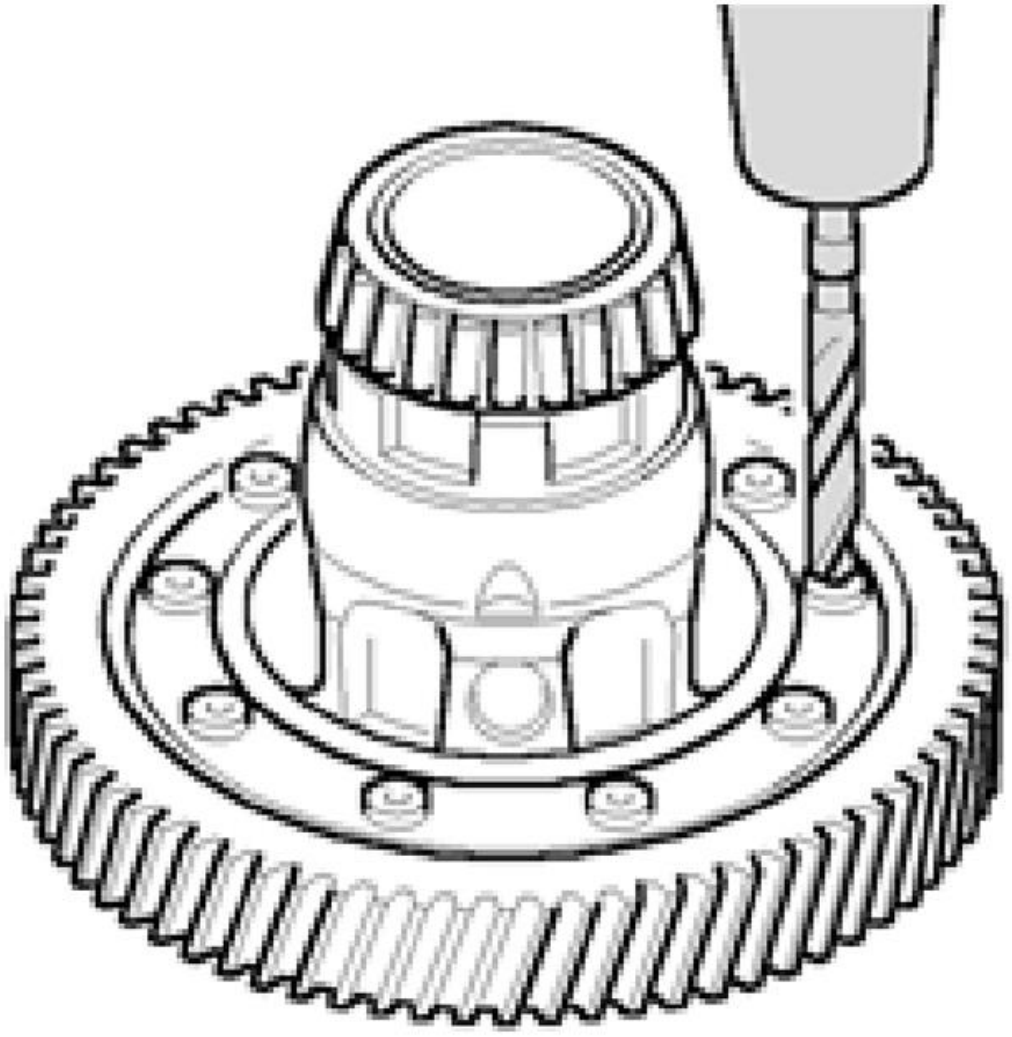


Fig. 174: Drilling Out Final Drive Gear Rivet Heads
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Clean differential before and after drilling, protect tapered roller bearing from metal particles.

Pressing off final drive gear

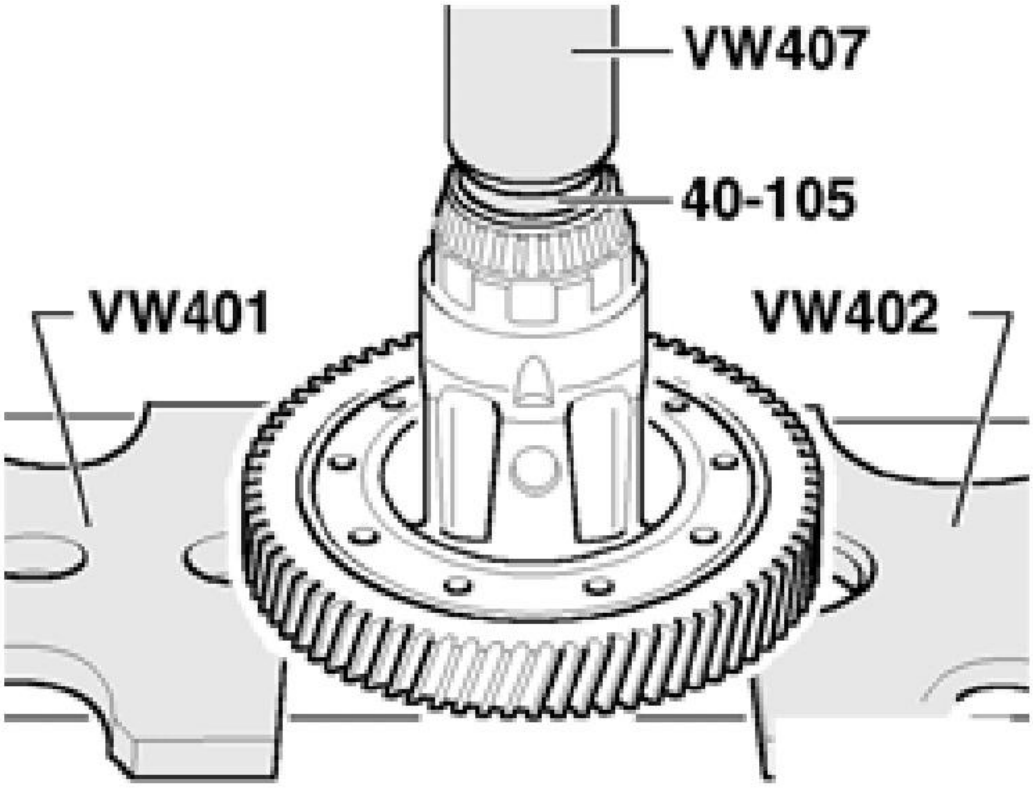


Fig. 175: Pressing Off Final Drive Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Place thrust piece 40-105 on differential housing.

Heating final drive gear to approx. 100° C and installing

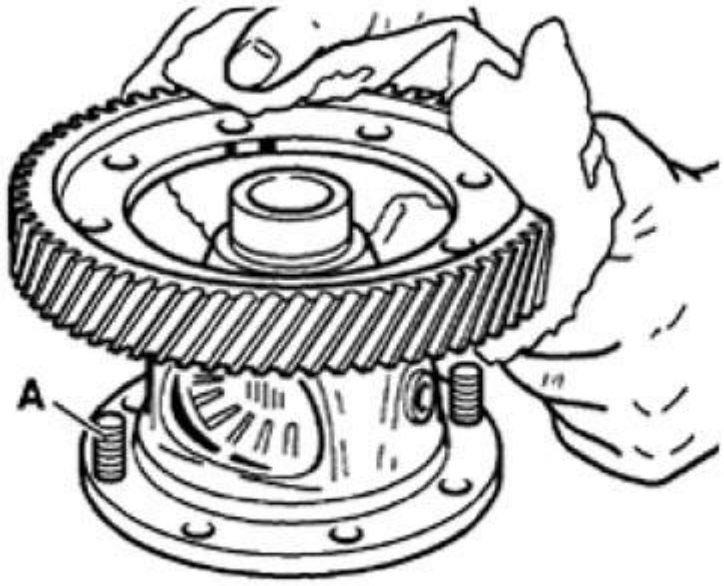


Fig. 176: Heating Final Drive Gear To Approx. 100°C And Installing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Use bolts -A- from repair kit to guide final drive gear into position during installation.

Bolting final drive gear -A- and differential housing -B- together

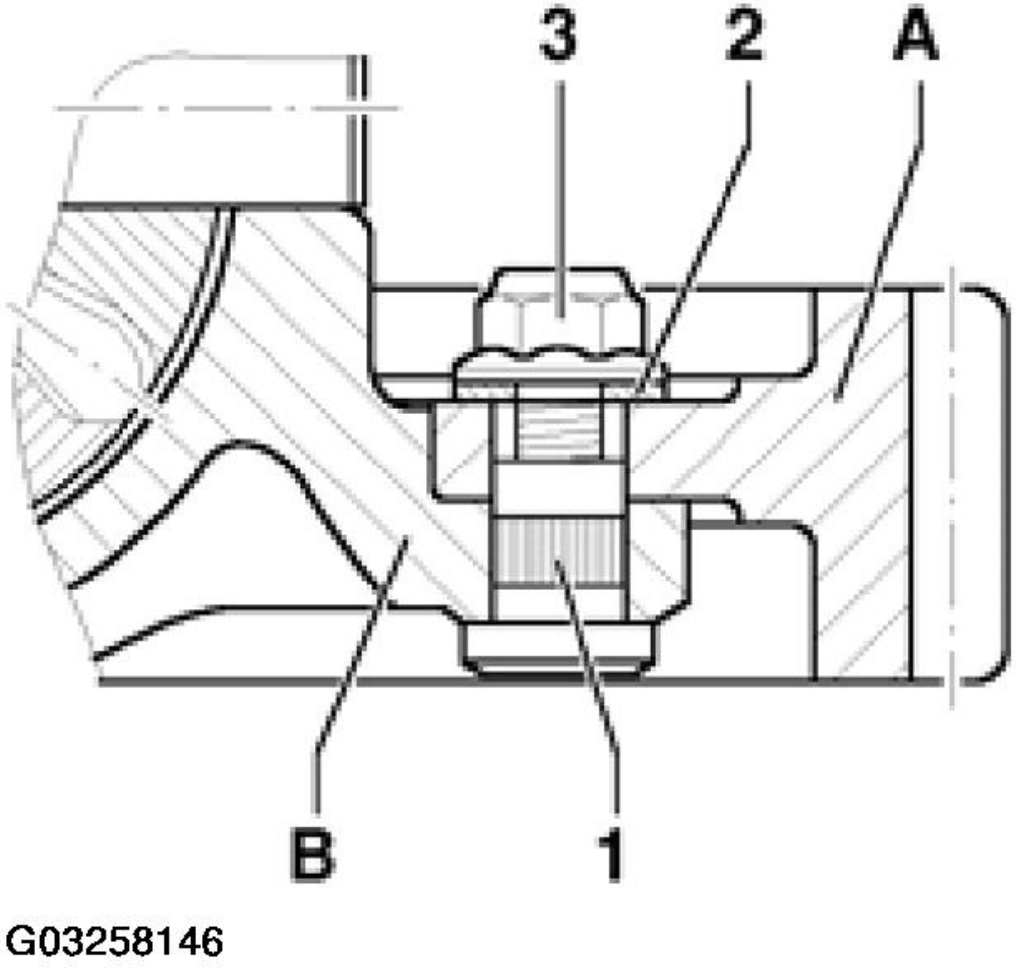
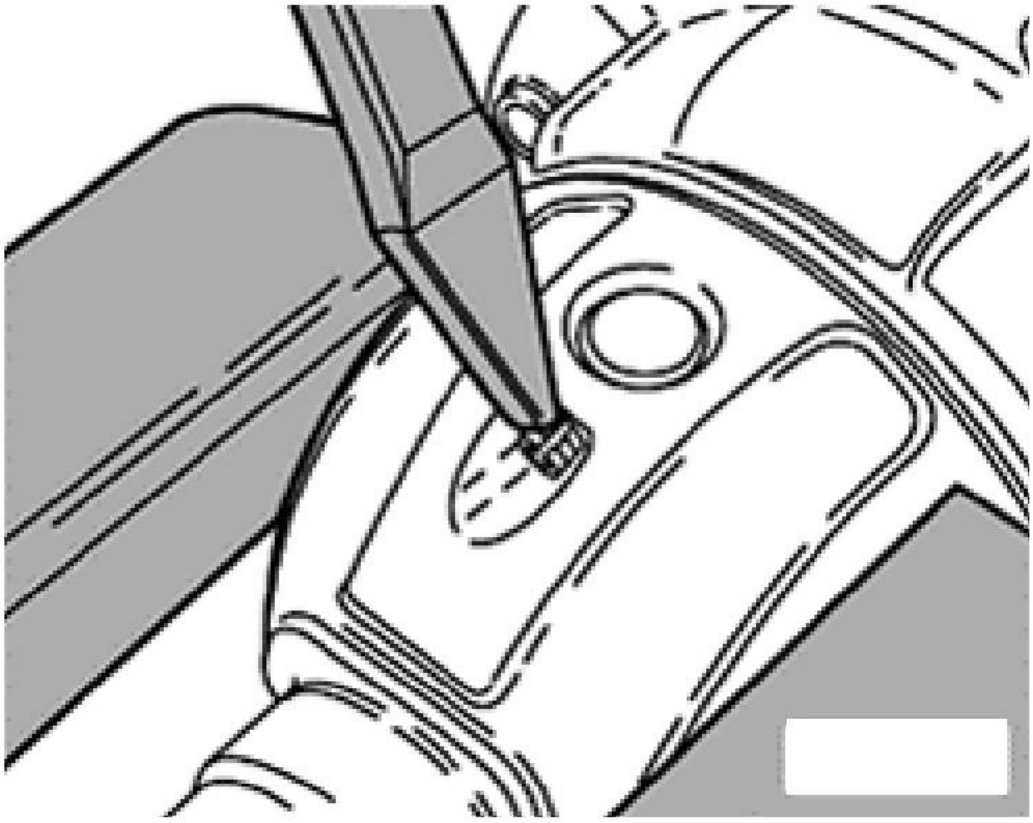


Fig. 177: Bolting Final Drive Gear -A- And Differential Housing -B- Together
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Use special bolts -1- with backing plates -2- and nuts -3- according to parts catalog.

Removing and installing differential bevel gear shaft spring pin



G03258147

Fig. 178: Removing And Installing Differential Bevel Gear Shaft Spring Pin
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing

- Cover tapered roller bearing inner race to avoid possible damage and ingress of metal particles.
- Knock out spring pin with chisel, inserting chisel into circumferential groove.

Installing

- Knock fully into differential cage.

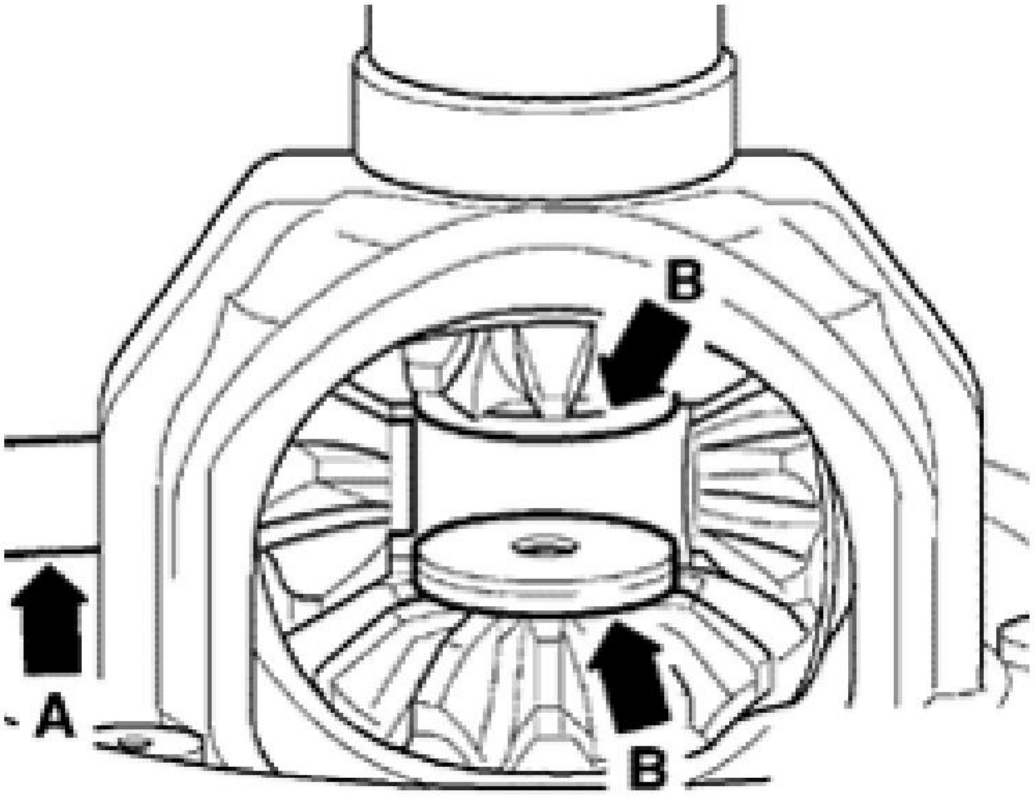
Installing differential bevel gears

- Lubricate one piece thrust washer with transmission oil and install.
- Install both large differential bevel gears and secure (e.g. with flanged shaft).

- Insert small differential bevel gears (180° apart) and pivot into position. See **Fig. 179** .
- Push differential bevel gear shaft (arrow -A-) in until first small bevel gear.
- Position threaded pieces (arrow -B-) in large bevel gears.

  Installation position: shoulder to bevel gear

- Drive differential bevel gear shaft into final position and secure with spring pin.



G03258148

Fig. 179: Installing Differential Bevel Gears
Courtesy of VOLKSWAGEN OF AMERICA, INC.

ADJUSTMENT OVERVIEW

NOTE: If transmission repairs have been performed, it is only necessary to adjust the input shaft, output shaft for 1st-4th gear, output shaft 5th, 6th and reverse gear or differential if components have been replaced which have a direct effect on

the adjustment of the transmission. Refer to ADJUSTMENT OVERVIEW table to avoid unnecessary adjustment.

ADJUSTMENT OVERVIEW

		To be adjusted:			
		Input shaft See **Input shaft, adjusting**	Output shaft 1st-4th gear See **Output shaft for 1st-4th gears, adjusting**	Output shaft 5th, 6th and reverse gear See **Output shaft for 5th, 6th and reverse gear, adjusting**	Differential See **DIFFERENTIAL, ADJUSTING**
Replaced part:	Transmission housing part:	X	X	X	X
	Clutch housing	X	X	X	X
	Input shaft	X			
	Output shaft for 1st-4th gear		X		
	Output shaft 5th, 6th and reverse gear			X	
	Differential housing				X
	Input shaft tapered roller bearing	X			
	Output shaft 1st-4th gear tapered roller bearing		X		
	Output shaft 5th, 6th and reverse gear tapered roller bearing			X	
	Differential tapered roller bearing				X

DIFFERENTIAL, ADJUSTING

Special tools and equipment

- VW 353 Transmission support
- VW 385/17 End measuring plate

- VW 387 Universal dial gauge bracket
- VW 402 Thrust plate
- VW 408 A Press tool
- 3005 Press disk

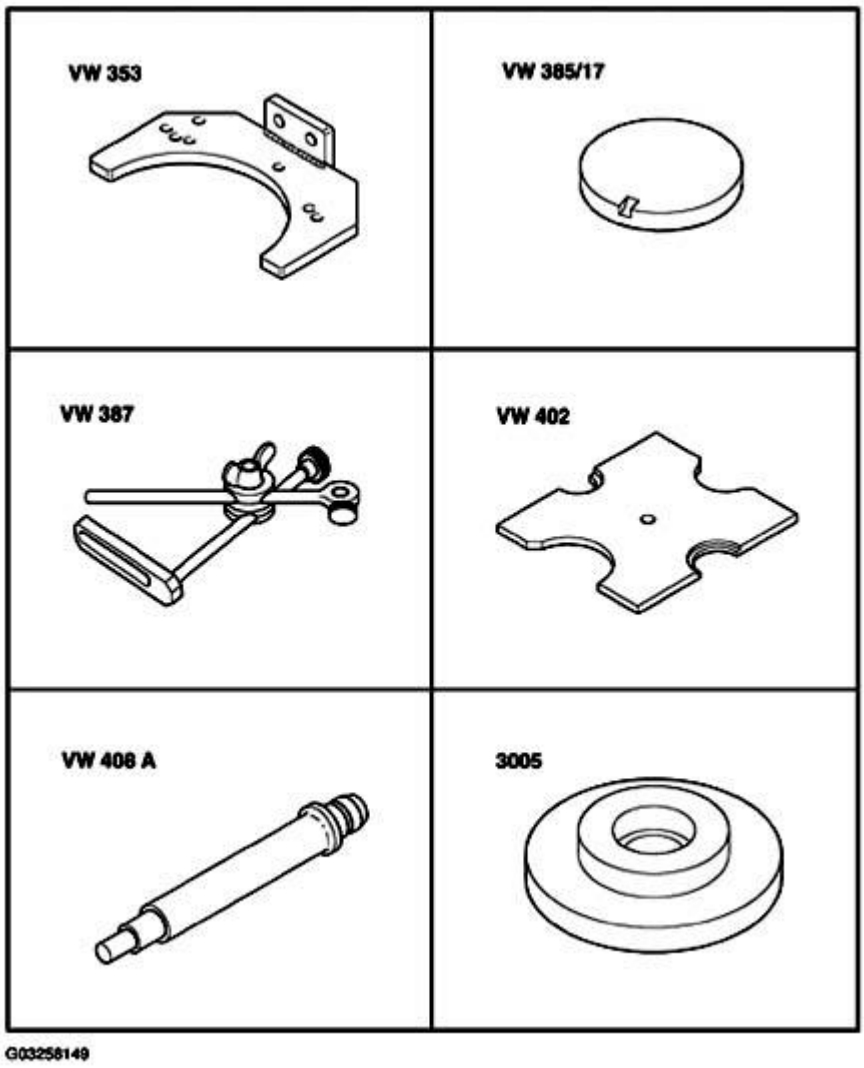


Fig. 180: Identifying Special Tools And Equipment (1 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 3259 Tube
- 3345 Tube
- V.A.G 1331 Torque wrench
- 1 - Kukko 21/7 Internal puller
- 4 - Kukko 22/2 Counter support

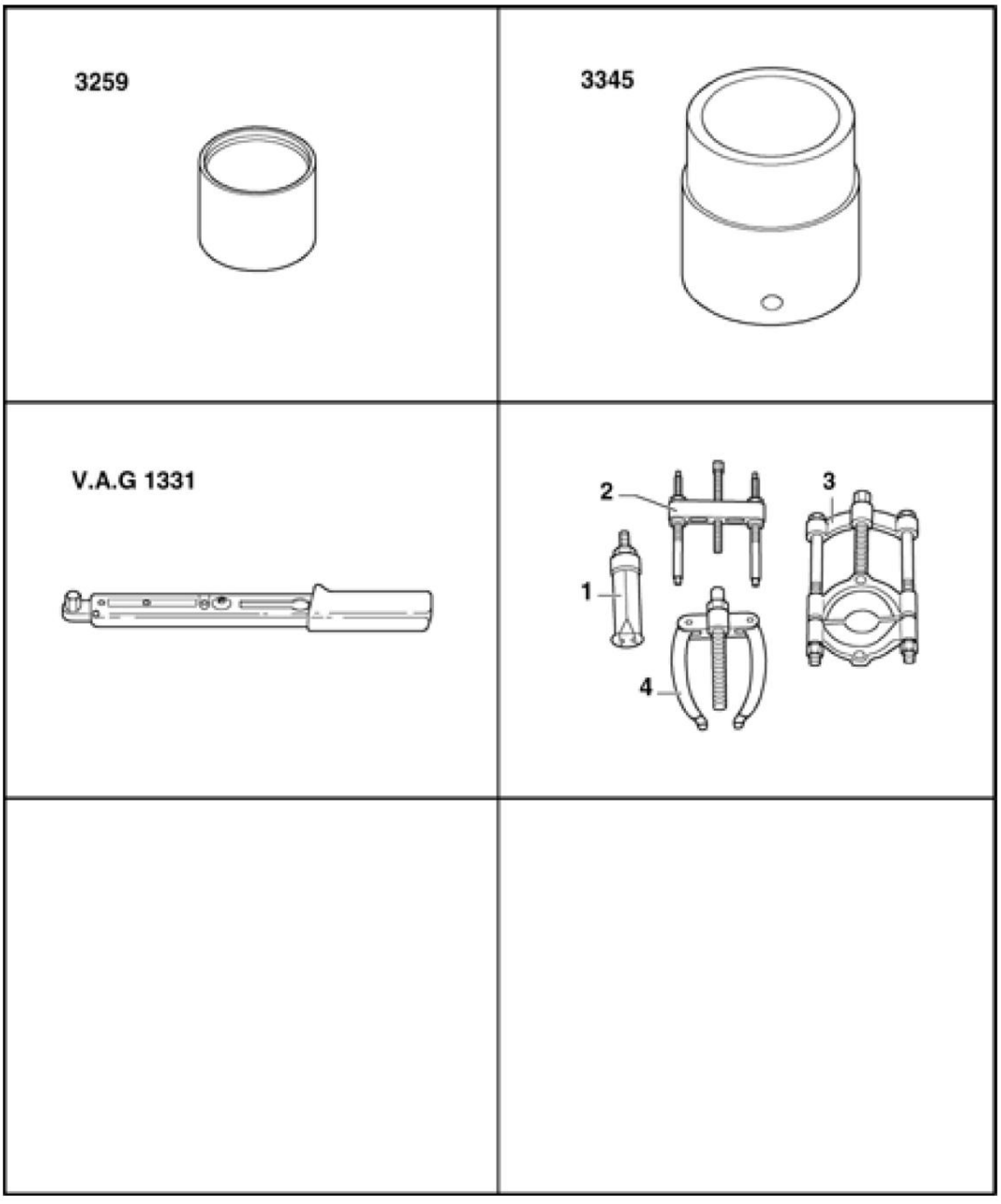


Fig. 181: Identifying Special Tools And Equipment (2 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The differential must be adjusted, when

- Transmission housing
- Clutch housing

- Differential housing

  or the

- Differential tapered roller bearing

  have been replaced.

Adjustment overview. See **ADJUSTMENT OVERVIEW** .

- Press tapered roller bearing outer race with shim (thickness 0.65 mm) into clutch housing. See **Removing and installing differential bevel gear shaft spring pin** .

  NOTE: Inner and outer tapered roller bearing races are a pair. Do not interchange.

- Press tapered roller bearing outer race without shim into transmission housing.

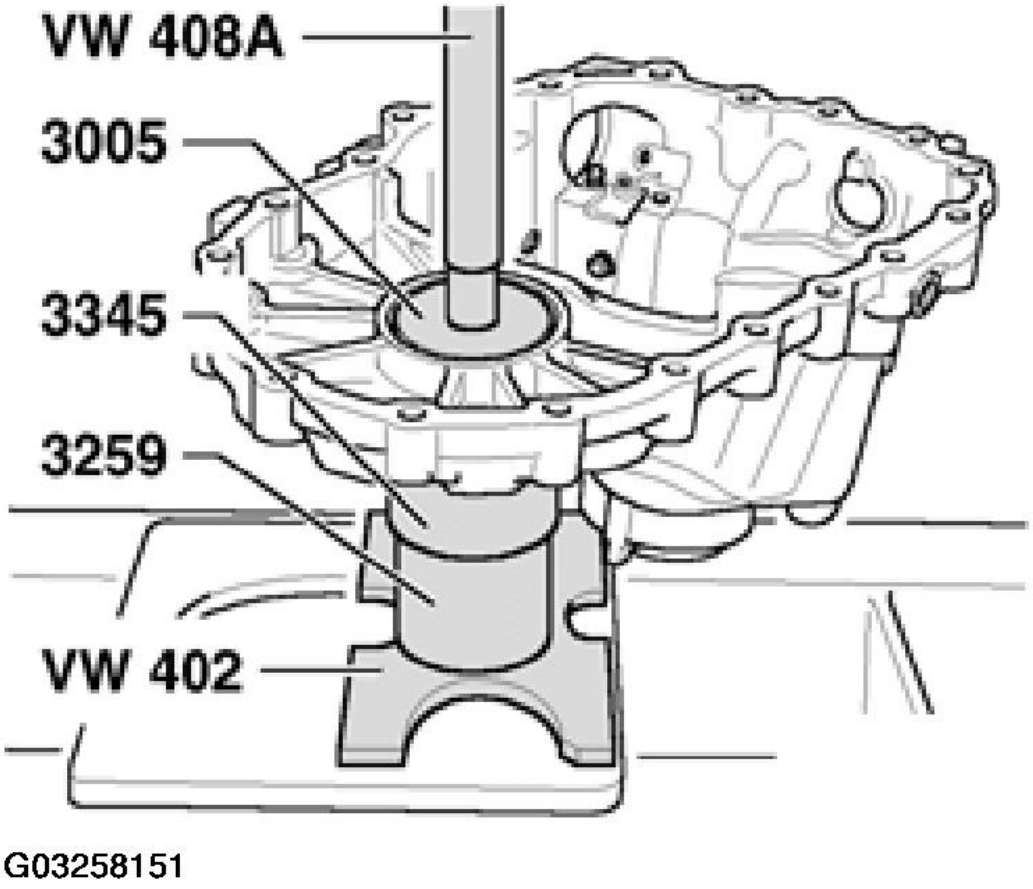


Fig. 182: Pressing Tapered Roller Bearing Outer Race Without Shim Into Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Fit differential into clutch housing
- Fit transmission housing and tighten 5 bolts to torque setting.
- Press differential in direction of clutch housing and when doing this turn it eight times.
- Press differential in direction of transmission housing and when doing this turn it eight times.
- Mount dial gauge and "0" with 1 mm preload.
  A. Dial gauge extension 30 mm

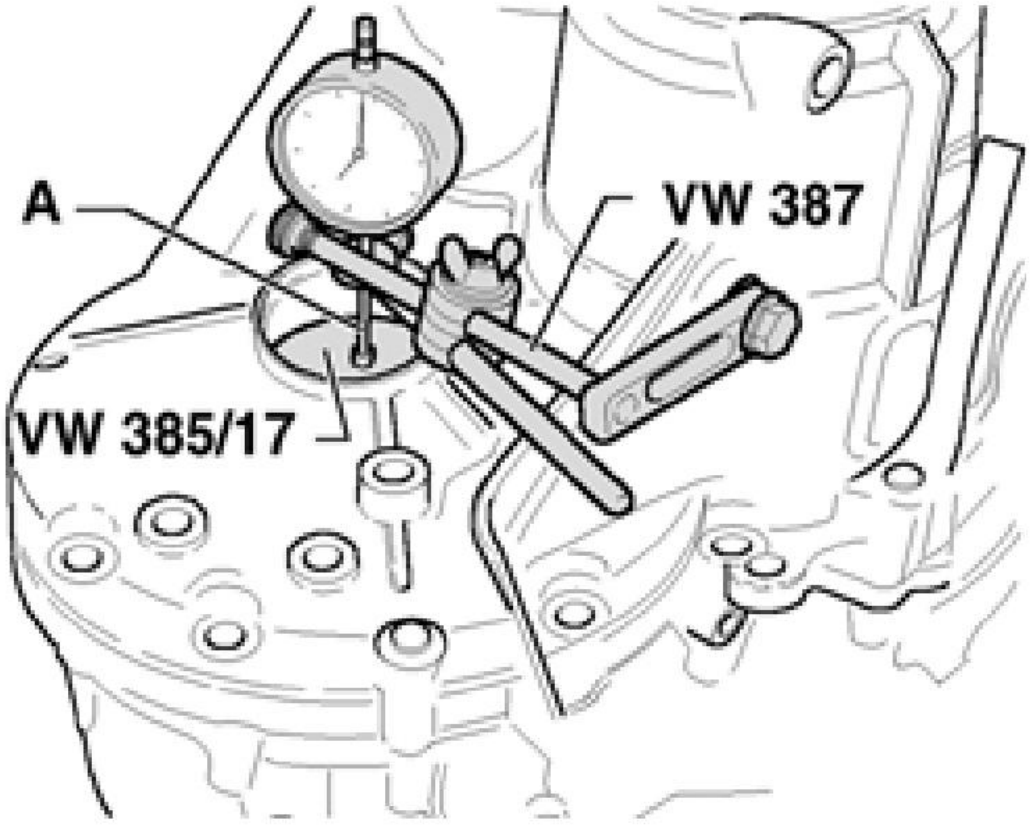


Fig. 183: Mounting Dial Gauge On Differential
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Move differential up and down and recall play indicated on dial gauge (Example: 0.70 mm).

Determining shim thickness

The specified bearing preload is obtained by adding a constant figure (0.30 mm) to reading obtained.

Example:

DETERMINING SHIM THICKNESS (EXAMPLE)

Reading 0.70 mm
+ Preload (constant figure) 0.30 mm
Thickness of shim = 1.00 mm

- Take off transmission housing.
- Pull tapered roller bearing outer race out of transmission housing.

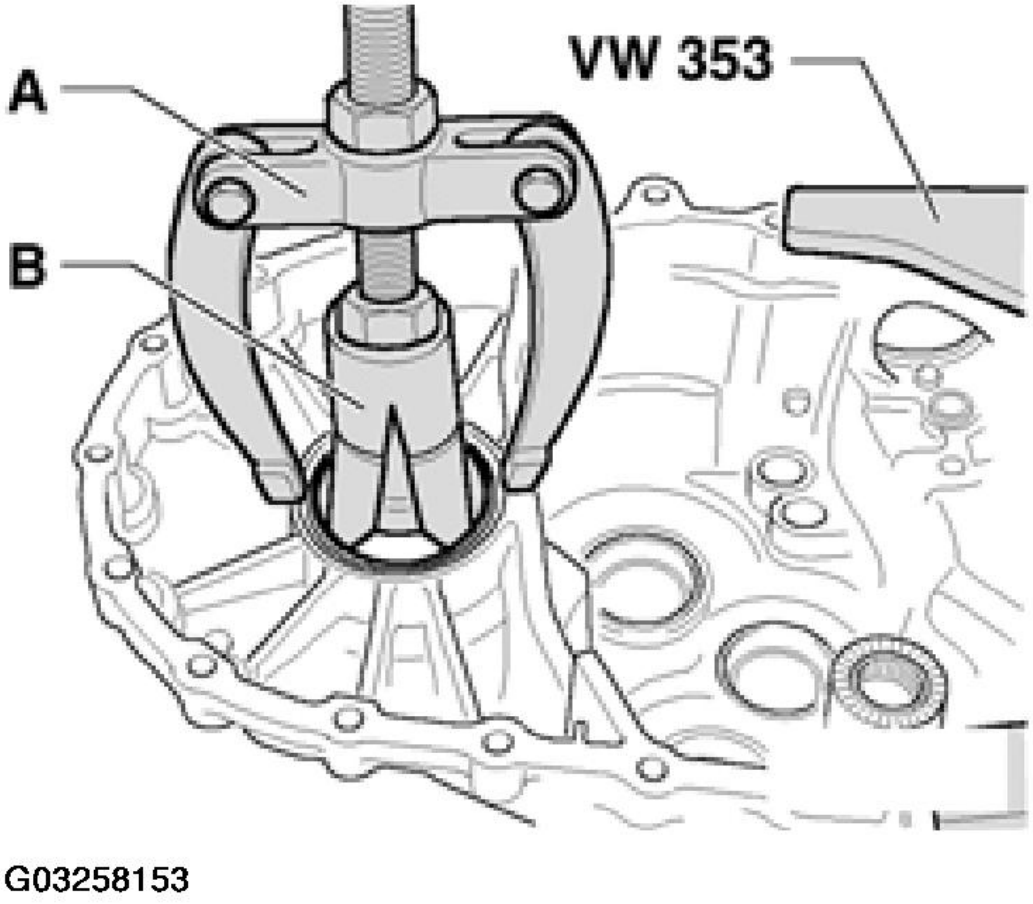


Fig. 184: Pulling Tapered Roller Bearing Outer Race Out Of Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Counter support, e.g. Kukko 22/2
B. Internal puller 46 to 58 mm, e.g. Kukko 21/7

- Insert shims of correct thickness, thickest shim first.

The following shims are available:

SHIMS SIZES (DIFFERENTIAL BEARING PRELOAD)

Size (mm)	Part No.
0.65	02B 409 210

0.70	02B 409 210 A
0.75	02B 409 210 B
0.80	02B 409 210 C
0.85	02B 409 210 D
0.90	02B 409 210 E
0.95	02B 409 210 F
1.00	02B 409 210 G
1.05	02B 409 210 H
1.10	02B 409 210 J
1.15	02B 409 210 K
1.20	02B 409 210 L
1.25	02B 409 210 M
1.30	02B 409 210 N
1.35	02B 409 210 P
1.40	02B 409 210 Q
0.70+0.75 = 1.45	02B 409 210 A/B
0.75+0.75 = 1.50	02B 409 210 B/B
0.75+0.80 = 1.55	02B 409 210 B/C
0.80+0.80 = 1.60	02B 409 210 C/C
0.80+0.85 = 1.65	02B 409 210 C/D

- Press outer race in again and tighten transmission housing to torque setting.

5 Spd. Manual Transmission 02J - New Beetle

GENERAL, TECHNICAL DATA

TRANSMISSION IDENTIFICATION

The 5-speed manual transmission 02J is installed in the New Beetle from 1998 in conjunction with 4-cylinder engines.

Application. See **CODE LETTERS, TRANSMISSION APPLICATION, RATIOS, CAPACITIES** .

Location on transmission

Code letters and date of manufacture (arrow 1) manual transmission 02J (arrow 2)

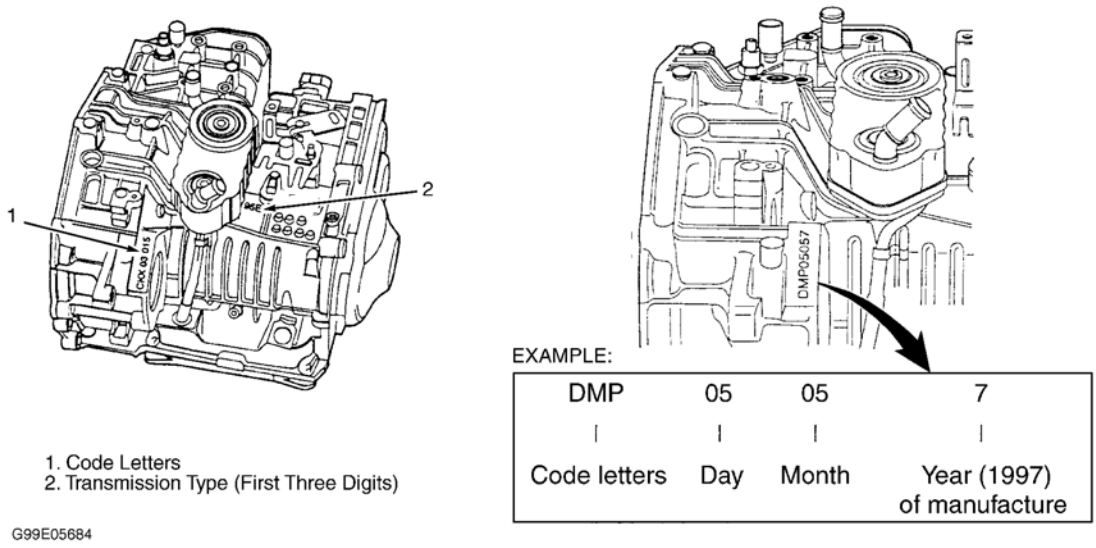


Fig. 1: Locating Code Letters And Date Of Manufacture
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Manual transmission 02J (arrow -2-)

Automatic transmission			01M					
Transmission	Codes		DYQ		ECN		ECP	
	Manufactured	from	11.97		08.98		08.98	
		to	08.98		05.99		05.99	
Torque converter For turbine shaft with sleeve bearing see TORQUE CONVERTER IDENTIFICATION	Codes		QBDC		QCDC		QCDC	
For turbine shaft without sleeve bearing see TORQUE CONVERTER IDENTIFICATION			QBDD		QCDD		QBDD	
Valve body	Codes		QFB		QFB		QFB	
	Manufactured	from	01.97		01.97		01.97	
		to						
Number of plates			Inner	Outer	Inner	Outer	Inner	Outer
	Clutch -K1-		5	5	5	5	5	5
	Clutch -K2-		4	4	5	5	5	5
	Clutch -K3-		5	4	6	5	6	5
	Brake -B1-		5	5	5	5	6	6
	Brake -B2-		4	5	5	6	5	6
Application	Model		New Beetle 1998		New Beetle 1998		New Beetle 1998	
	Engine		2.0 ltr. - 85 kW		1.9 ltr. - 66 kW TDI		1.8 ltr. - 110 kW	

G00389939

Fig. 2: Locating Code Letters And Date Of Manufacture Manual Transmission 02J
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Code letters and date of manufacture of transmission

Transmission	Codes		DYQ	ECN	ECP
Ratios	1st gear		2.714	2.714	2.714
	2nd gear		1.551	1.441	1.441
	3rd gear		1.000	1.000	1.000
	4th gear		0.679	0.742	0.742
	Reverse gear		2.111	2.884	2.884
Intermediate drive	No. of teeth	Input gear	61	45	45
		Output gear	63	44	44
	Ratio		1.033	0.978	0.978
Final drive	No. of teeth	Drive pinion	16	20	15
		Ring gear	78	74	68
	Ratio		4.875	3.700	4.533
Drive shaft	Flange dia. mm		Triple roller	Triple roller	Triple roller
ATF cooler	Equipment		Pressure-side 6-row	Pressure-side 6-row	Pressure-side 6-row

G00389940

Fig. 3: Identifying Code Letters And Date Of Manufacture Of Transmission
Courtesy of VOLKSWAGEN OF AMERICA, INC.

TRANSMISSION CODE LETTERS AND DATE SPECIFICATION

Example:	DZQ	06	05	8
Explanatio n	Code letters	Day	Month	Year (1998) of manufacture

Additional data depends on manufacture.

NOTE: The transmission code letters are also shown on the vehicle identification plates.

02J TRANSMISSION SPECIFICATIONS (TO 09.00) - 1 OF 4

Manual transmission		**5-speed 02J**		
Code letters		**DQY**	**DZQ**	**EBJ**
Manufactured	from to	06.97 09.00	08.97 08.98	08.98 09.00
Application	Model	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**
Application	Engine	1.9 l - 66 kW TDI	2.0 I - 85 kW	1.9 I - 66 kW TDI
Ratio: $Z_2 : Z_1$	Final drive	61 : 18 = 3.389	72 : 17 = 4.235	61 : 18 = 3.389
	1st gear	34 : 9 = 3.778	34 : 9 = 3.778	34 : 9 = 3.778
	2nd gear	36 : 17 = 2.118	36 : 17 = 2.118	36 : 17 = 2.118
	3rd gear	34 : 25 = 1.360	34 : 25 = 1.360	34 : 25 = 1.360
	4th gear	34 : 35 = 0.971	35 : 34 = 1.029	34 : 35 = 0.971
	5th gear	34 : 45 = 0.756	36 : 43 = 0.837	34 : 45 = 0.756
	6th gear	-	-	-
	Reverse gear	18 : 9 x 36 : 20 = 3.600	18 : 9 x 36 : 20 = 3.600	18 : 9 x 36 : 20 = 3.600
Speedometer		13 : 22 = 0.591	13 : 22 = 0.591	13 : 22 = 0.591

02J TRANSMISSION SPECIFICATIONS (TO 09.00) - 2 OF 4

Code letters	**DQY**	**DZQ**	**EBJ**
Lubricant capacity	2.0 Liters	2.0 Liters	2.0 Liters
Lubricant specification	Transmission oil G50 SAE 75W90 (synthetic oil)		
Clutch control	hydraulic	hydraulic	hydraulic
Clutch disc diameter	228 mm(1) , (2)	215 mm	228 mm(1) , (2)
Drive shaft flange diameter	100 mm	100 mm	100 mm
i. overall ratio in top gear	2.562	3.545	2.562

(1) Two-part flywheel

(2) Allocate the clutch plate using parts catalog.

New selector mechanism as of 06.99. Transmission selector cover has been revised.

All transmissions can be filled with transmission oil G 052 726 A2 SAE 75W.

02J TRANSMISSION SPECIFICATIONS (TO 09.00) - 3 OF 4

Manual transmission		**5-speed 02J**		
Code letters		**EBP**	**EBQ**	**EGR**
Manufactured	from	05.99	05.99	09.00

	to	09.00	09.00	
Application	Model	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**
Application	Engine	2.0 I - 85 kW	1.8 I - 110 kW Turbo	1.9 I - 66 kW TDI
Ratio: $Z_2 : Z_1$	Final drive	72 : 17 = 4.235	63 : 16 = 3.938	61 : 18 = 3.389
	1st gear	34 : 9 = 3.778	33 : 10 = 3300	34 : 9 = 3.778
	2nd gear	36 : 17 = 2.118	35 : 18 = 1.944	36 : 17 = 2.118
	3rd gear	34 : 25 = 1.360	34 : 26 = 1.308	34 : 25 = 1.360
	4th gear	35 : 34 = 1.029	35 : 34 = 1.029	34 : 35 = 0.971
	5th gear	36 : 43 = 0.837	36 : 43 = 0.837	34 : 45 = 0.756
	6th gear	-	-	-
	Reverse gear	18 : 9 x 36 : 20 = 3.600	17 : 10 x 36 : 20 = 3.060	18 : 9 x 36 : 20 = 3.600
Speedometer		13 : 22 = 0.591	13 : 22 = 0.591	13 : 22 = 0.591

From 09.00 modified synchronization for the first gear

02J TRANSMISSION SPECIFICATIONS (TO 09.00) - 4 OF 4

Code letters	**EBP**	**EBQ**	**EGR**
Lubricant capacity	2.0 Liters	2.0 Liters	2.0 Liters
Lubricant specification	Transmission oil G50 SAE 75W90 (synthetic oil)		
Clutch control	hydraulic	hydraulic	hydraulic
Clutch disc diameter	215 mm	225 mm(1)	228 mm(1)
Drive shaft flange diameter	100 mm	108 mm(2)	100 mm
i. overall ratio in top gear	3.545	3.296	2.562
(1) Two-part flywheel			
(2) Triple roller joint drive shaft			

New selector mechanism as of 06.99. Transmission selector cover has been revised.

All transmissions can be filled with transmission oil G 052 726 A2 SAE 75W.

02J TRANSMISSION SPECIFICATIONS (FROM 09.00) - 1 OF 8

Manual transmission		**5-speed 02J**		
Code letters		**EGS**	**EGT**	**EGX**
Manufactured	from to	09.00	09.00	09.00
Application	Model	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**
Application	Engine	1.9 I - 74 kW	2.0 I - 85 kW	1.8 I - 110 kW

		TDI		Turbo
Ratio: $Z_2 : Z_1$	Final drive	61 : 18 = 3.389	72 : 17 = 4.235	63 : 16 = 3.938
	1st gear	34 : 09 = 3.778	34 : 9 = 3.778	33 : 10 = 3.300
	2nd gear	33 : 16 = 2.063	36 : 17 = 2.118	35 : 18 = 1.944
	3rd gear	31 : 23 = 1.348	34 : 25 = 1.360	34 : 26 = 1.308
	4th gear	29 : 30 = 0.967	35 : 34 = 1.029	35 : 34 = 1.029
	5th gear	30 : 39 = 0.769	36 : 43 = 0.837	36 : 43 = 0.837
	6th gear	-	-	-
	Reverse gear	18 : 9 x 36 : 20 = 3.600	18 : 9 x 36 : 20 = 3.600	17 : 10 x 36 : 20 = 3.060
Speedometer		13 : 22 = 0.591	13 : 22 = 0.591	13 : 22 = 0.591

From 09.00 modified synchronization for the first gear

02J TRANSMISSION SPECIFICATIONS (FROM 09.00) - 2 OF 8

Code letters	**EGS**	**EGT**	**EGX**
Lubricant capacity	2.0 Liters	2.0 Liters	2.0 Liters
Lubricant specification	Transmission oil G50 SAE 75W90 (synthetic oil)		
Clutch control	hydraulic	hydraulic	hydraulic
Clutch disc diameter	228 mm(1)	215 mm	225 mm(1)
Drive shaft flange diameter	108 mm(2)	100 mm	108 mm(2)
i. overall ratio in top gear	2.606	3.545	3.296
(1) Two-part flywheel			
(2) Triple roller joint drive shaft			

New selector mechanism as of 06.99. Transmission selector cover has been revised.

All transmissions can be filled with transmission oil G 052 726 A2 SAE 75W.

02J TRANSMISSION SPECIFICATIONS (FROM 09.00) - 3 OF 8

Manual transmission		**5-speed 02J**		
Code letters		**EKG**	**EZH**	**EZK**
Manufactured	from to	09.00	09.00 10.99	09.00
Application	Model	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**
Application	Engine	2.0 I - 85 kW	2.0 I - 85 kW	2.0 I - 85 kW
Ratio: $Z_2 : Z_1$	Final drive	72 : 17 = 4.235	72 : 17 = 4.235	72 : 17 = 4.235
	1st gear	34 : 9 = 3.778	34 : 9 = 3.778	34 : 9 = 3.778
	2nd gear	36 : 17 = 2.118	36 : 17 = 2.118	36 : 17 = 2.118

	3rd gear	34 : 25 = 1.360	34 : 25 = 1.360	34 : 25 = 1.360
	4th gear	35 : 34 = 1.029	35 : 34 = 1.029	35 : 34 = 1.029
	5th gear	36 : 43 = 0.837	36 : 43 = 0.837	36 : 43 = 0.837
	6th gear	-	-	-
	Reverse gear	18 : 9 x 36 : 20 = 3.600	18 : 9 x 36 : 20 = 3.600	18 : 9 x 36 : 20 = 3.600
Speedometer		13 : 22 = 0.591	13 : 22 = 0.591	13 : 22 = 0.591

From 09.00 modified synchronization for the first gear

02J TRANSMISSION SPECIFICATIONS (FROM 09.00) - 4 OF 8

Code letters	**EKG**	**EZH**	**EZK**
Lubricant capacity	2.0 Liters	2.0 Liters	2.0 Liters
Lubricant specification	Transmission oil G50 SAE 75W90 (synthetic oil)		
Clutch control	hydraulic	hydraulic	hydraulic
Clutch disc diameter	215 mm	215 mm	215 mm
Drive shaft flange diameter	100 mm	100 mm	100 mm
i. overall ratio in top gear	3.545	3.545	3.545

New selector mechanism as of 06.99. Transmission selector cover has been revised.

All transmissions can be filled with transmission oil G 052 726 A2 SAE 75W.

02J TRANSMISSION SPECIFICATIONS (FROM 09.00) - 5 OF 8

Manual transmission		**5-speed 02J**		
Code letters		**FBV**	**FBW**	**FDS**
Manufactured	from to	05.00 09.00	05.00 09.00	09.00
Application	Model	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**
Application	Engine	2.0 l - 85 kW	1.8 l - 110 kW Turbo	1.8 l - 110 kW Turbo
Ratio: $Z^2 : Z^1$	Final drive	72 : 17 = 4.235	63 : 16 = 3.938	63 : 16 = 3.938
	1st gear	34 : 9 = 3.778	33 : 10 = 3.300	33 : 10 = 3.300
	2nd gear	36 : 17 = 2.118	35 : 18 = 1.944	35 : 18 = 1.944
	3rd gear	34 : 25 = 1.360	34 : 26 = 1.308	34 : 26 = 1.308
	4th gear	35 : 34 = 1.029	35 : 34 = 1.029	35 : 34 = 1.029
	5th gear	36 : 43 = 0.837	36 : 43 = 0.837	36 : 43 = 0.837
	6th gear	-	-	-
	Reverse gear	18 :9 x 36 : 20 = 3.600	17 : 10 x 36 : 20 = 3.060	17 : 10 x 36 : 20 = 3.060
Speedometer		13 : 22 = 0.591	13 : 22 = 0.591	13 : 22 = 0.591

From 09.00 modified synchronization for the first gear

02J TRANSMISSION SPECIFICATIONS (FROM 09.00) - 6 OF 8

Code letters	**FBV**	**FBW**	**FDS**
Lubricant capacity	2.0 Liters	2.0 Liters	2.0 Liters
Lubricant specification	Transmission oil G50 SAE 75W90 (synthetic oil)		
Clutch control	hydraulic	hydraulic	hydraulic
Clutch disc diameter	215 mm	225 mm(1)	225 mm(1)
Drive shaft flange diameter	100 mm	108 mm(2)	108 mm(2)
i. overall ratio in top gear	3.545	3.296	3.296
(1) Two-part flywheel (2) Triple roller joint drive shaft			

New selector mechanism as of 06.99. Transmission selector cover has been revised.

All transmissions can be filled with transmission oil G 052 726 A2 SAE 75W.

02J TRANSMISSION SPECIFICATIONS (FROM 09.00) - 7 OF 8

Manual transmission		**5-speed 02J**
Code letters		**FDU**
Manufactured	from to	09.00
Application	Model	**New Beetle From 1998 And On**
Application	Engine	2.0 I - 85 kW
Ratio: $Z^2 : Z^1$	Final drive	72 : 17 = 4.235
	1st gear	34 : 9 = 3.778
	2nd gear	36 : 17 = 2.118
	3rd gear	34 : 25 = 1.360
	4th gear	35 : 34 = 1.029
	5th gear	36 : 43 = 0.837
	6th gear	-
	Reverse gear	18 : 9 x 36 : 20 = 3.600
Speedometer		13 : 22 = 0.591

From 09.00 modified synchronization for the first gear

02J TRANSMISSION SPECIFICATIONS (FROM 09.00) - 8 OF 8

Code letters	**FDU**
Lubricant capacity	2.0 Liters
Lubricant specification	Transmission oil G50 SAE 75W90 (synthetic oil)
Clutch control	hydraulic

Clutch disc diameter	215 mm
Drive shaft flange diameter	100 mm
i. overall ratio in top gear	3.545

New selector mechanism as of 06.99. Transmission selector cover has been revised.

All transmissions can be filled with transmission oil G 052 726 A2 SAE 75W.

TRANSMISSION LAYOUT

Designation

NOTE: The following list refers to items in Fig. 4 .

1. **Engine**
2. **Clutch**
3. **Transmission**
4. **Input shaft**
5. **Output shaft/pinion shaft**
6. **Differential**

Arrows point in direction of travel

Automatic transmission			01M					
Gearbox	Code letters		EFB		ECV		FDB	
	Manufactured	from	10.98		08.98		03.00	
		to	05.99		05.99			
Torque converter	Codes							
For turbine shaft with sleeve bearing see TORQUE CONVERTER IDENTIFICATION			QBDC		QBDC		-	
For turbine shaft without sleeve bearing see TORQUE CONVERTER IDENTIFICATION			QBDD		QADD		QCDD	
Valve body	Codes		QFB		QFB		QFB	
	Manufactured	from	01.97		01.97		03.00	
		to						
Number of plates			Inner	Outer	Inner	Outer	Inner	Outer
	Clutch -K1-		5	5	5	5	5	5
	Clutch -K2-		4	4	4	4	5	5
	Clutch -K3-		5	4	5	4	6	5
	Brake -B1-		5	5	5	5	5	5
	Brake -B2-		4	5	4	5	5	6
Application	Model		New Beetle 1998		New Beetle 1998		New Beetle 1998	
	Engine		2.0 ltr. - 85		2.0 ltr. - 85		1.9 ltr. - 66 kW	

G00389941

Fig. 4: Identifying Transmission Layout (1 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Gear ratios

NOTE: The following list refers to items in Fig. 5 .

I - 1st gear

II - 2nd gear
III - 3rd gear
IV - 4th gear
V - 5th gear
R - Reverse gear
A - Final drive
T - Speedometer drive

Arrows point in direction of travel

Transmission	Code letters		EFB	ECV	FDB
Ratios	1st gear		2.714	2.714	2.714
	2nd gear		1.441	1.551	1.441
	3rd gear		1.000	1.000	1.000
	4th gear		0.742	0.679	0.742
	Reverse gear		2.884	2.111	2.884
Intermediate drive	No. of teeth	Input gear	45	61	45
		Output gear	44	63	44
	Ratio		0.978	1.033	0.978
Final drive	No. of teeth	Drive pinion	15	16	20
		Ring gear	68	78	74
	Ratio		4.533	4.875	3.700
Drive shaft	Flange dia. mm		Triple roller	Triple roller	Triple roller
ATF cooler	Equipment		Pressure-side 6-row	Pressure-side 6-row	Pressure-side 6-row

G00389942

Fig. 5: Identifying Transmission Layout (2 Of 2)

Courtesy of VOLKSWAGEN OF AMERICA, INC.

CALCULATING OVERALL RATIO "I"

Example:

CALCULATING OVERALL RATIO "i" (EXAMPLE)

Gear	5th gear	Final drive
Driving gear	$ZG_1 = 43$	$ZA_1 = 17$
Driven gear	$ZG_2 = 36$	$ZA_2 = 72$

i= Z_2 "DIVIDE" Z_1[1])

I_G =Gear ratio = ZG_2 / ZG_1 =36 / 43 = 0.837

I_A = Final drive ratio = ZA_2 / ZA_1 = 72 / 17 = 4.235

i = Total ratio

= I_G x I_A = 0.837 x 4.235 = 3.545

[1)] Z_1 = No. of teeth driving gear, Z_2 = No. of teeth driven gear

GENERAL REPAIR INSTRUCTIONS

To ensure perfect transmission repairs, the greatest care and cleanliness as well as the use of good and proper tools is essential. Obviously, the basis rules for safety are also applicable during repair work.

A number of generally valid instructions applicable for the various repair procedures - which were previously repeated a number of times at numerous places in the Repair Manual - are summarized here. They apply to this Repair Manual.

Transmission

- When installing make sure that the dowel sleeves between the engine and transmission are correctly located.
- When changing a transmission fill with gear oil to the lower edge of the filler hole.
- Capacities and specifications. See **CODE LETTERS, TRANSMISSION APPLICATION, RATIOS, CAPACITIES** .

NOTE:

- **If the oil level is topped off with the transmission installed, carry out oil level check as follows:**

- **Fill with oil to the lower edge of the filler hole and install filler plug. Start the engine, engage a gear and allow transmission to turn for approx. 2 minutes. Switch off engine and again top off oil to lower edge of filler hole.**

Gaskets, sealing rings

- Thoroughly clean joint surfaces and apply sealant AMV 188 200 03.
- Apply sealant uniformly but not too thick.
- Replace "O-rings".
- Radial shaft oil seals.

Before installation:

- Lightly oil outer edge, fill space between sealing lips -arrow-with grease G 052 128 A1.

Automatic transmission			01M					
Transmission	Code letters		ELU		ELT		ELY	
	Manufactured	from	05.99		05.99		05.99	
		to	12.99		12.99		12.99	
Torque converter For turbine shaft with sleeve see TORQUE CONVERTER IDENTIFICATION	Code letters		QCDC		QCDC		QBDC	
For turbine shaft without sleeve bearing see TORQUE CONVERTER IDENTIFICATION			QCDD		QCDD		QBDD	
Valve body	Code letters		QFB		QFB		QFB	
	Manufactured	from	03.00		03.00		03.00	
		to						
Number of plates			Inner	Outer	Inner	Outer	Inner	Outer
	Clutch -K1-		5	5	5	5	5	5
	Clutch -K2-		5	5	5	5	4	4
	Clutch -K3-		6	5	6	5	5	4
	Brake -B1-		6	6	5	5	5	5
	Brake -B2-		5	6	5	6	4	5
Application	Model		New Beetle 1998		New Beetle 1998		New Beetle 1998	
	Engine		1.8 ltr. - 110 kW		1.9 ltr. - 66 kW TDI		2.0 ltr. - 85 kW	

G00389943

Fig. 6: Identifying Oil Seal Lip
Courtesy of VOLKSWAGEN OF AMERICA, INC.

After installation:

Check transmission oil; if necessary top-off to lower edge of oil filler hole, specification. See **CODE LETTERS, TRANSMISSION APPLICATION, RATIOS, CAPACITIES** .

Locking devices

- Replace circlips.
- Do not overstretch circlips.
- Circlips must be install properly in the groove.
- Replace spring pins. Installation position: Slot longitudinal to line of force.

Transmission	Code letters		ELU	ELT	ELY
Ratios	1st gear		2.714	2.714	2.714
	2nd gear		1.441	1.441	1.551
	3rd gear		1.000	1.000	1.000
	4th gear		0.742	0.742	0.679
	Reverse gear		2.884	2.884	2.111
Intermediate drive	No. of teeth	Input gear	45	45	61
		Output gear	44	44	63
	Ratio		0.978	0.978	1.033
Final drive	No. of teeth	Drive pinion	15	20	16
		Ring gear	68	74	78
	Ratio		4.533	3.700	4.875
Drive shaft	Flange dia. mm		Triple roller	Triple roller	Triple roller
ATF cooler	Equipment		Pressure-side 6-row	Pressure-side 6-row	Pressure-side 6-row

G00389944

Fig. 7: Replacing Circlips
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Bolts and nuts

- Tighten and loosen bolts and nuts for securing covers and housings in a diagonal sequence.
- Delicate parts, must not be distorted, such as clutch pressure plates. Loosen and tighten nuts and bolts in

stages in a diagonal sequence.

- Tightening torques as specified are for unoiled bolts and nuts.
- Replace self-locking bolts and nuts.
- Make sure with threaded connections that the areas of the contact surfaces as well as the visible surfaces of nuts and bolts are rewaxed after assembly.

Bearings

- Install new tapered roller bearings as supplied and do not lubricate.
- Install needle bearings with lettered side (thicker metal) toward installing tool.
- Tapered roller bearings installed to one shaft must be replaced as a set. Use same make of bearings.
- Heat inner races to approx. 100 °C before installing.

Shims

- Measure shims at several points with a micrometer. Tolerance variations make it possible to find the exact shim thickness required.
- Check for burrs and damage.
- Only install perfect shims.

Synchronizer rings

- Do not interchange. When reusing always install to the same gear.
- Check for wear and replace if necessary.
- Coat with gear oil before installing.

Gear wheels

- Before installing clean and heat on a hot plate to approx. 100° C.
- Temperature can be checked with temperature tester V.A.G 1558.

MANUAL TRANSMISSION - CONTROLS, HOUSING

TRANSMISSION, DISASSEMBLING AND ASSEMBLING

Transmission overview

NOTE: The following list refers to items in Fig. 8 .

1. **1st gear**
2. **2nd gear**
3. **3rd gear**
4. **4th gear**

5. **5th gear**
6. **Transmission housing**
    - Servicing. See **TRANSMISSION HOUSING AND CLUTCH HOUSING, SERVICING**
7. **Selector mechanism**
    - (Selector forks)
    - Disassembling and assembling. See **SELECTOR FORKS, DISASSEMBLING AND ASSEMBLING**
8. **Input gear for 1st and reverse gear**
9. **Input shaft**
    - Disassembling and assembling. See **INPUT SHAFT, DISASSEMBLING AND ASSEMBLING**
10. **Output shaft**
    - Disassembling and assembling. See **Output shaft, disassembling and assembling**
11. **Differential**
    - Disassembling and assembling. See **Differential, disassembling and assembling**
12. **Clutch housing**
    - Servicing. See **TRANSMISSION HOUSING AND CLUTCH HOUSING, SERVICING**

Automatic transmission		01M					
Transmission	Codes	ELZ		EPB		EPC	
	Manufactured from	05.99		12.99		12.99	
	to	12.99		03.00		02.00	
Torque converter	Codes	QBDC		QCDD		QCDD	
Valve body	Code letters	QFB		QFB		QFB	
	Manufactured from	03.00		03.00		03.00	
	to						
Number of plates		Inner	Outer	Inner	Outer	Inner	Outer
	Clutch -K1-	5	5	5	5	5	5
	Clutch -K2-	4	4	5	5	5	5
	Clutch -K3-	5	4	6	5	6	5
	Brake -B1-	5	5	5	5	6	6
	Brake -B2-	4	5	5	6	5	6
Application	Model	New Beetle 1998		New Beetle 1998		New Beetle 1998	
	Engine	2.0 ltr. - 85 kW		1.9 ltr. - 66 kW TDI		1.8 ltr. - 110 kW	

G00389945

Fig. 8: Sectional View Of O2J Transmission
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Assembly overview

NOTE: The following list refers to items in Fig. 9 .

I. **Removing and installing cover for transmission housing and 5th gear. See COVER FOR TRANSMISSION HOUSING AND 5TH GEAR, REMOVING AND INSTALLING**
II. **Disassembling and assembling transmission housing and shift mechanism. See TRANSMISSION HOUSING AND SELECTOR MECHANISM, REMOVING AND INSTALLING**
III. **Disassembling and assembling input shaft, output shaft, differential and selector forks. See INPUT**

SHAFT, OUTPUT SHAFT (PINION SHAFT), DIFFERENTIAL AND SELECTOR FORKS, REMOVING AND INSTALLING

Transmission	Codes		ELZ	EPB	EPC
Ratios	1st gear		2.714	2.714	2.714
	2nd gear		1.441	1.441	1.441
	3rd gear		1.000	1.000	1.000
	4th gear		0.742	0.742	0.742
	Reverse gear		2.884	2.884	2.884
Intermediate drive	No. of teeth	Input gear	45	45	45
		Output gear	44	44	44
	Ratio		0.978	0.978	0.978
Final drive	No. of teeth	Drive pinion	15	20	15
		Ring gear	68	74	68
	Ratio		4.533	3.700	4.533
Drive shaft	Flange dia. mm		Triple roller	Triple roller	Triple roller
ATF cooler	Equipment		Pressure-side 6-row	Pressure-side 6-row	Pressure-side 6-row

G00389946

Fig. 9: Identifying Assembly Overview
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Cover for transmission housing and 5th gear, removing and installing

NOTE: The following list refers to items in Fig. 10 .

1. **Hex bolt, 10 N.m**
   - For transmission housing cover
2. **Transmission housing cover**

NOTE: **If the transmission cover is installed with the transmission installed, check oil level as follows:**

- **Fill with oil to lower edge of filler hole and install filler plug.**
- **Start engine, engage gear and allow transmission to turn for approx. 2 minutes.**
- **Switch off engine and top off transmission oil to lower edge of filler hole again.**

3. **Gasket**
4. **5Torx socket head bolt M10, 80 N.m**
   - Install piece on bolt head holds saucer spring washer in position
5. **Dished spring**
   - Installing. See **INSTALLATION POSITION OF DISHED SPRING FOR GEAR WHEEL AND 5TH GEAR SYNCHRO-HUB SECURING BOLTS:**
6. **Socket head bolt, 25 N.m**
   - For pivot pin to transmission housing
7. **Pivot pin**
8. **5th gear selector fork**
   - Disassembling and assembling. See **SELECTOR FORKS, DISASSEMBLING AND ASSEMBLING**
   - Adjusting. See **ADJUSTING 5TH GEAR:**
9. **5th gear locking collar**
   - Installation position. See **CHECKING 5TH GEAR SYNCHRO-RING**
   - Adjusting. See **ADJUSTING 5TH GEAR:**
10. **Synchro-hub with 5th gear and synchronizing ring**
    - Disassembling and assembling. See **5th gear synchronizer**
11. **Needle roller bearing**
12. **5th speed gear wheel**
    - Installation position. See **INSTALLATION POSITION 5TH GEAR WHEEL**

Automatic transmission		01M					
Transmission	Codes	FDC		FDF		FDG	
	Manufactured from to	02.00		02.00		02.00	
Torque converter	Codes	QCDD		QBDD		QBDD	
Valve body	Code letters	QFB		QFB		QFB	
	Manufactured from to	03.00		03.00		03.00	
Number of plates		Inner	Outer	Inner	Outer	Inner	Outer
	Clutch -K1-	5	5	5	5	5	5
	Clutch -K2-	5	5	4	4	4	4
	Clutch -K3-	6	5	5	4	5	4
	Brake -B1-	6	6	5	5	5	5
	Brake -B2-	5	6	4	5	4	5
Application	Model	New Beetle 1998		New Beetle 1998		New Beetle 1998	
	Engine	1.8 ltr. - 110 kW		2.0 ltr. - 85 kW		2.0 ltr. - 85 kW	

G00389947

Fig. 10: Exploded View Of Transmission Housing Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Transmission housing and selector mechanism, removing and installing

NOTE: The following list refers to items in Fig. 11 .

1. **Cone head bolt, 25 N.m**
2. **Flange shaft with spring**
   - Removing and installing. See **ASSEMBLY SEQUENCE**
   - Complement. See item 19 Flange Shaft
3. **Torx socket head bolt, 30 N.m**
   - For reverse shaft support

- Self-locking
- Always replace

4. **O-ring**
    - Always replace
5. **Pivot pin**
6. **Bolt, 25 N.m**
7. **Bolt, 25 N.m**
8. **Cover plate**
9. **Transmission housing**
    - Servicing. See **TRANSMISSION HOUSING AND CLUTCH HOUSING, SERVICING**
10. **Clutch housing**
    - Servicing. See **TRANSMISSION HOUSING AND CLUTCH HOUSING, SERVICING**
11. **Hex bolt, 25 N.m then turn 90° further**
12. **Selector mechanism**
    - Disassembling and assembling on vehicles up to 05.99. See **SELECTOR MECHANISM ON TRANSMISSION SIDE, UP TO 05.99, DISASSEMBLING AND ASSEMBLING**
    - Disassembling and assembling on vehicles as of 06.99. See **SELECTOR MECHANISM ON TRANSMISSION SIDE, AS OF 06.99, DISASSEMBLING AND ASSEMBLING**
13. **Hex bolt, 25 N.m**

Transmission	Codes		FDC	FDF	FDG
Ratios	1st gear		2.714	2.714	2.714
	2nd gear		1.441	1.551	1.441
	3rd gear		1.000	1.000	1.000
	4th gear		0.742	0.679	0.742
	Reverse gear		2.884	2.111	2.884
Intermediate drive	No. of teeth	Input gear	45	61	45
		Output gear	44	63	44
	Ratio		0.978	1.033	0.978
Final drive	No. of teeth	Pinion shaft	15	16	15
		Ring gear	68	78	68
	Ratio		4.533	4.875	4.533
Drive shaft	Flange dia. mm		Triple roller	Triple roller	Triple roller
ATF cooler	Equipment		Pressure-side 6-row	Pressure-side 6-row	Pressure-side 6-row

G00389948

Fig. 11: Exploded View Of Transmission Housing And Selector Mechanism
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Input shaft, output shaft (pinion shaft), differential and selector forks, removing and installing

NOTE: The following list refers to items in Fig. 12 .

1. **Differential**
   - Disassembling and assembling. See **Differential, disassembling and assembling**
2. **Oil seal**
   - Qty. 4

- Always replace

3. **Output shaft**
   - Disassembling and assembling. See **Output shaft, disassembling and assembling**
4. **Reverse shaft support**
   - Disassembling and assembling. See item6 Reverse Shaft
5. **Reverse shaft**
   - Disassembling and assembling. See **Reverse shaft, disassembling and assembling**
6. **Input shaft**
   - Disassembling and assembling. See **INPUT SHAFT, DISASSEMBLING AND ASSEMBLING**
7. **Reverse gear selector fork**
   - Disassembling and assembling. See **SELECTOR FORKS, DISASSEMBLING AND ASSEMBLING**
   - Installation position. See **ASSEMBLING**
8. **Torx socket head bolt, 25 N.m**
9. **Selector mechanism**
   - (Selector forks)
   - Disassembling and assembling. See **SELECTOR FORKS, DISASSEMBLING AND ASSEMBLING**
10. **Clutch housing**
    - Servicing. See **TRANSMISSION HOUSING AND CLUTCH HOUSING, SERVICING**
11. **Hex nut, 25 N.m and then turn 90° further**
    - 4 nuts for bearing support
12. **Flange shaft with spring**
    - Removing and installing. See **ASSEMBLY SEQUENCE**
    - Assembling. See item 19 Flange Shaft
13. **Cone head bolt, 25 N.m**

Automatic transmission		01M					
Transmission	Codes	EPG		EPH		EPP	
	Manufactured from	12.99		12.99		12.99	
	to	02.00		02.00			
Torque converter	Codes	QBDD		QBDD		QCDD	
Valve body	Codes	QFB		QFB		QFA	
	Manufactured from	03.00		03.00		03.00	
	to						
Number of plates		Inner	Outer	Inner	Outer	Inner	Outer
	Clutch -K1-	5	5	5	5	5	5
	Clutch -K2-	4	4	4	4	5	5
	Clutch -K3-	5	4	5	4	6	5
	Brake -B1-	5	5	5	5	5	5
	Brake -B2-	4	5	4	5	5	6
Application	Model	New Beetle 1998		New Beetle 1998		New Beetle 1998	
	Engine	2.0 ltr. - 85 kW		2.0 ltr. - 85 kW		1.9 ltr. - 66 kW TDI	

G00389949

Fig. 12: Identifying Input Shaft, Output Shaft (Pinion Shaft), Differential And Selector Forks
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Disassembling and assembling transmission housing cover, transmission housing, selector mechanism, input shaft, output shaft (pinion shaft), differential and selector forks

Special tools and equipment

- VW 309 Holding plate
- VW 353 Transmission support
- VW 295 Drift
- VW 244 B Fitting sleeve

- VAG 1416 Hot air blower

Transmission	Codes		EPG	EPH	EPP
Ratios	1st gear		2.714	2.714	2.714
	2nd gear		1.551	1.441	1.441
	3rd gear		1.000	1.000	1.000
	4th gear		0.679	0.742	0.742
	Reverse gear		2.111	2.884	2.884
Intermediate drive	No. of teeth	Input gear	61	45	45
		Output gear	63	44	44
	Ratio		1.033	0.978	0.978
Final drive	No. of teeth	Pinion shaft	16	15	22
		Ring gear	78	68	72
	Ratio		4.875	4.533	3.273
Drive shaft	Flange dia. mm		Triple roller	Triple roller	Triple roller
ATF cooler	Equipment		Pressure side 6-row	Pressure side 6-row	Pressure side 6-row

G00389950

Fig. 13: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Disassembling

- Mount transmission on repair stand.

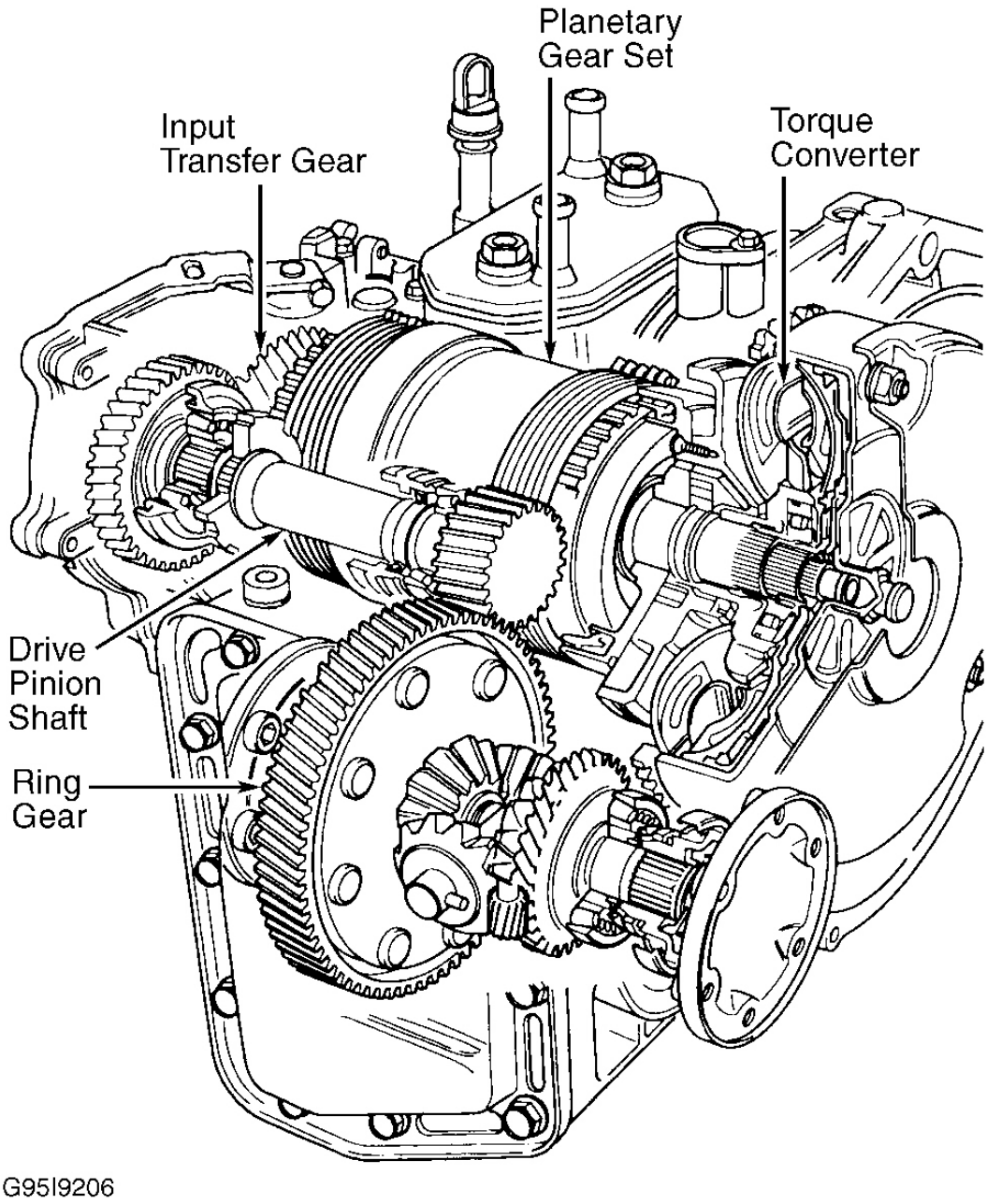
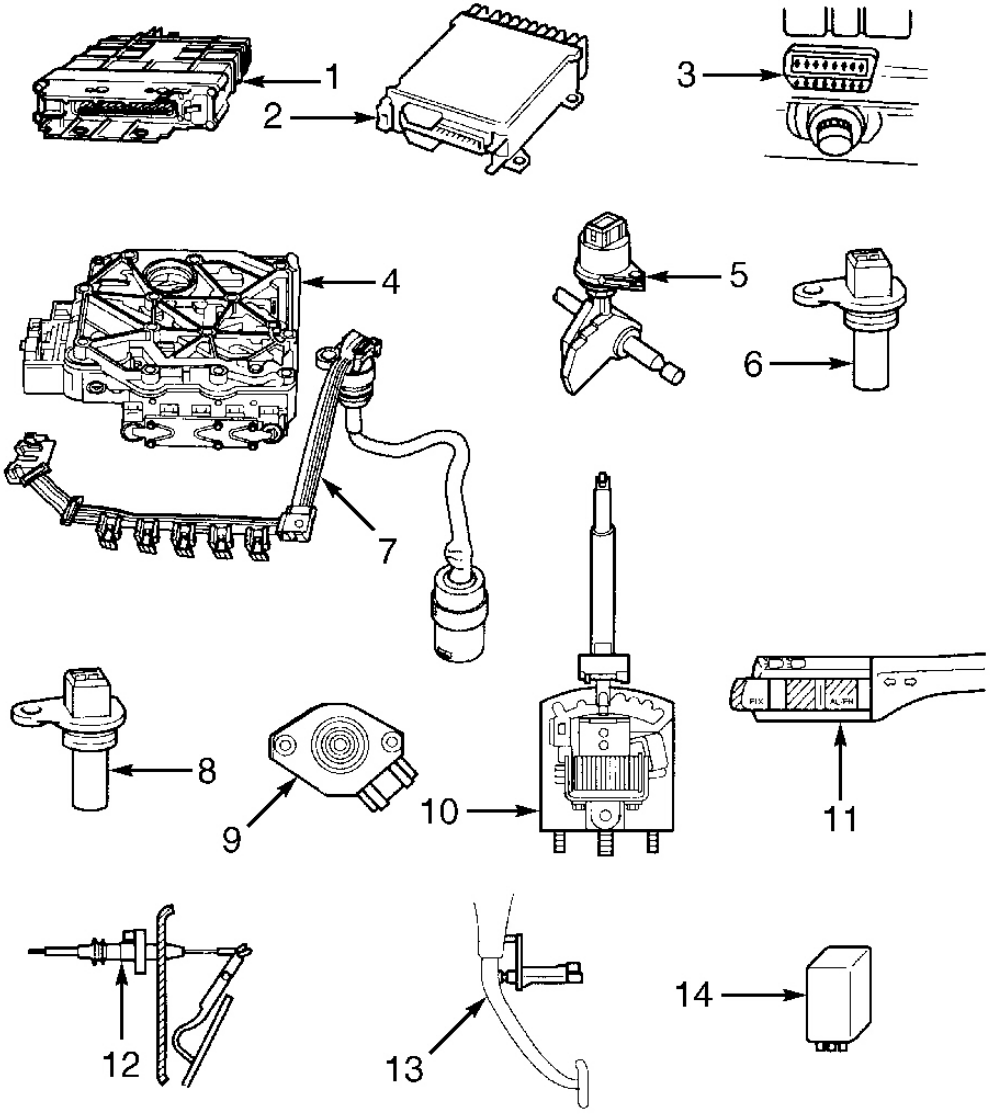


Fig. 14: Mounting Transmission On Repair Stand
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Drain transmission oil.
- Remove clutch release lever and release bearing. See **CLUTCH RELEASE BEARING** .
- Remove guide sleeve. See **CLUTCH RELEASE BEARING** .

- Remove transmission housing cover (arrow).

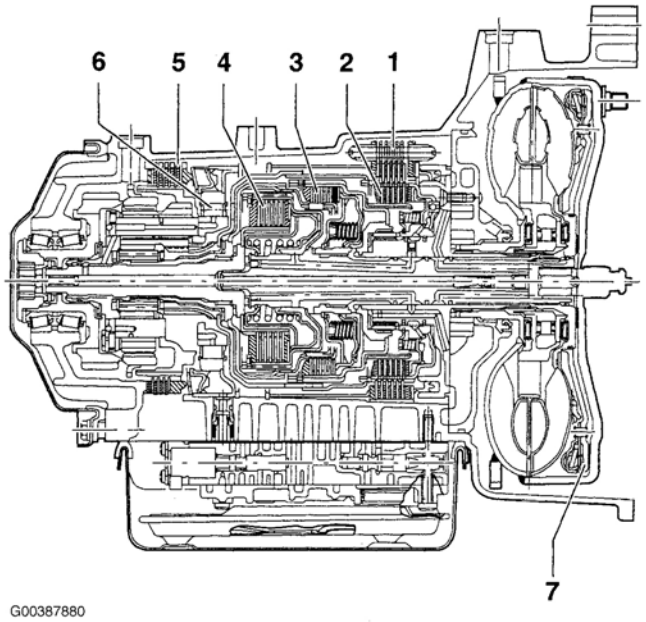


1. Transmission Control Module (TCM)
2. Powertrain Control Module (PCM)
3. Data Link Connector (DLC)
4. Valve Body
5. Transmission Range (TR) Switch
6. Transmission Vehicle Speed Sensor (VSS)
7. Conductor Strip (With Integrated Transmission Fluid Temperature Sensor)
8. Vehicle Speed Sensor (VSS)
9. Throttle Position (TP) Sensor
10. Shift Lock Solenoid
11. Cruise Control Solenoid
12. Kickdown Switch
13. Brakelight Switch
14. Park/Neutral Position Relay

G96C04631

Fig. 15: Removing Transmission Housing Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove 5th gear selector fork (arrow)



1 = 2nd and 4th gear brake -B2-

2 = Reverse gear clutch -K2-

3 = 1st to 3rd gear clutch -K1-

4 = 3rd and 4th gear clutch -K3-

5 = Reverse gear brake -B1-

6 = Free wheel clutch

7 = Lock-up clutch integrated in torque converter -LC-

Fig. 16: Removing 5th Gear Selector Fork
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove spring for locking piece.
- Remove locking collar and take off locking piece.
- Slide locking collar, without selector fork, over synchro-hub again.
- Remove bolts -A- for synchro-hub and 5th gear, to do this select 5th (arrow -1-) and 1st gear (arrows -2- and -3-).

Gear	B1	B2	K1	K2	K3	F	LC
R	X			X			
1H			X			X	
1M			X			X	X
2H		X	X				
2M		X	X				X
3H			X		X		
3M			X		X		X
4H		X			X		
4M		X			X		X

X = clutches, brakes or freewheel engaged

H = hydraulic

M = mechanical

G00387881

Fig. 17: Removing Synchro-Hub And 5th Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- After engaging both gears input shaft and output shaft are locked, synchro-hub and gear wheel cannot turn. Both bolts can now be loosened.
- Take off locking collar.
- Pull off synchro-hub and 5th gear wheel and remove together with needle roller bearing.

A. Two arm puller e.g. Kukko 20/10 with Matra V/170 hooks.
B. Hex bolt M10 x 20

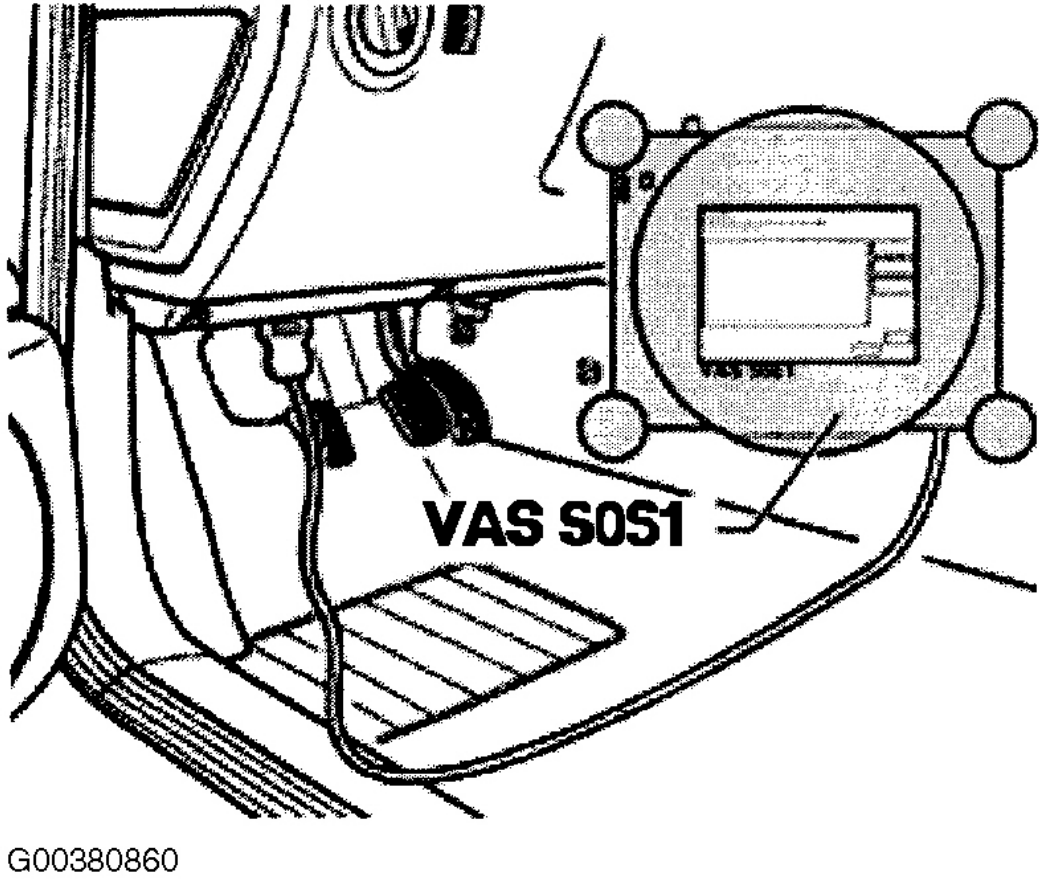


Fig. 18: Removing Synchro-Hub And 5th Gear Wheel With Needle Roller Bearing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Pull off 5th gear wheel
  A. Two arm puller e.g. Kukko 20/10 with Matra V/170 hooks.
  B. Hex bolt M10 x 20

Sequence for removing:

- Install two arm puller and centralize by turning screw (arrow).
- Heat gear wheel with hot air blower VAG 1416 and pull off.

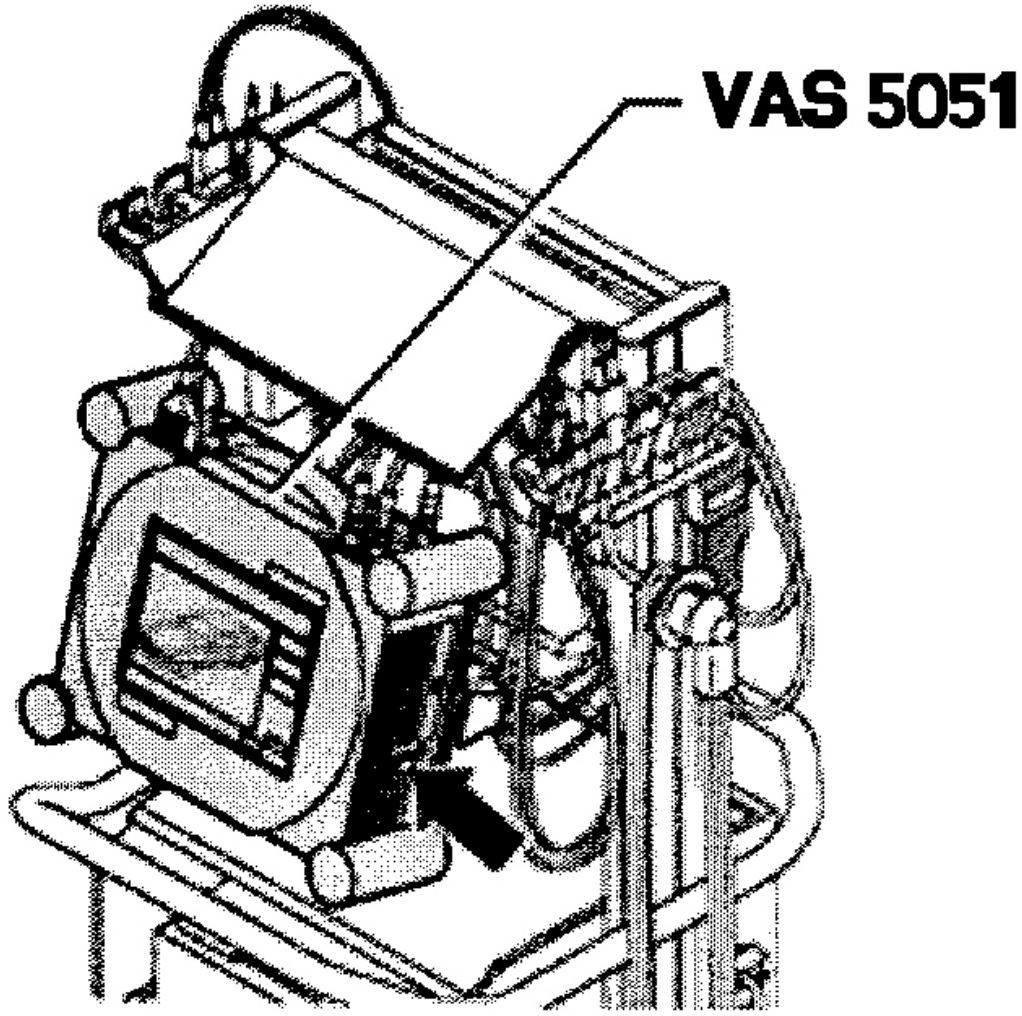


Fig. 19: Removing 5th Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: When pulling off the gear wheel make sure that the hooks do not bend outward, if necessary tighten screw (arrow). After 5th gear wheel has been removed check for damage.

- Remove both flange shafts.

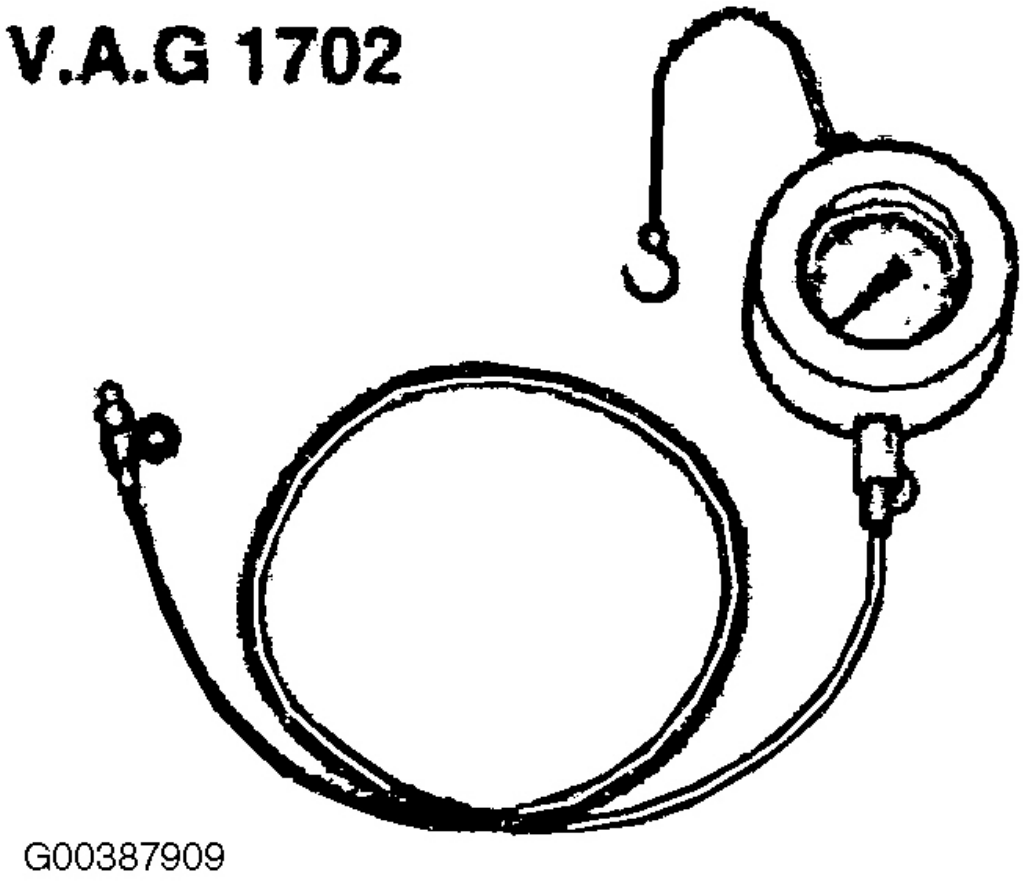


Fig. 20: Removing Flange Shafts
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Take out flange shafts along with springs, thrust washers and tapered rings.
- Remove both reverse shaft support bracket bolts (arrows).

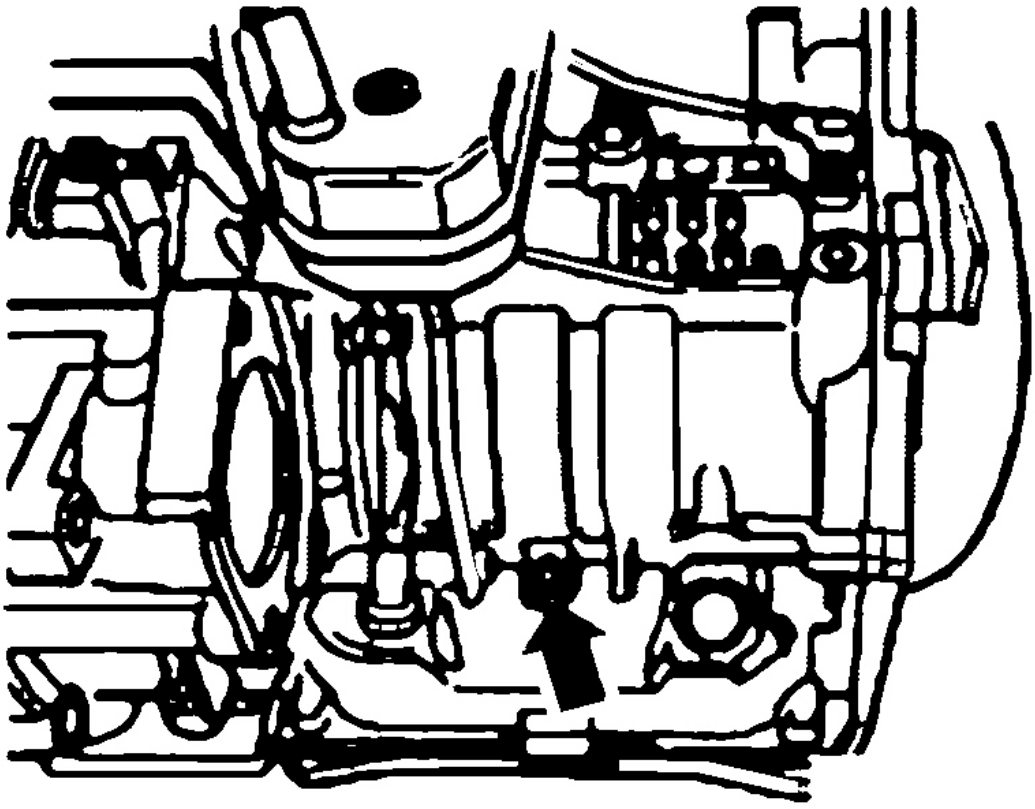
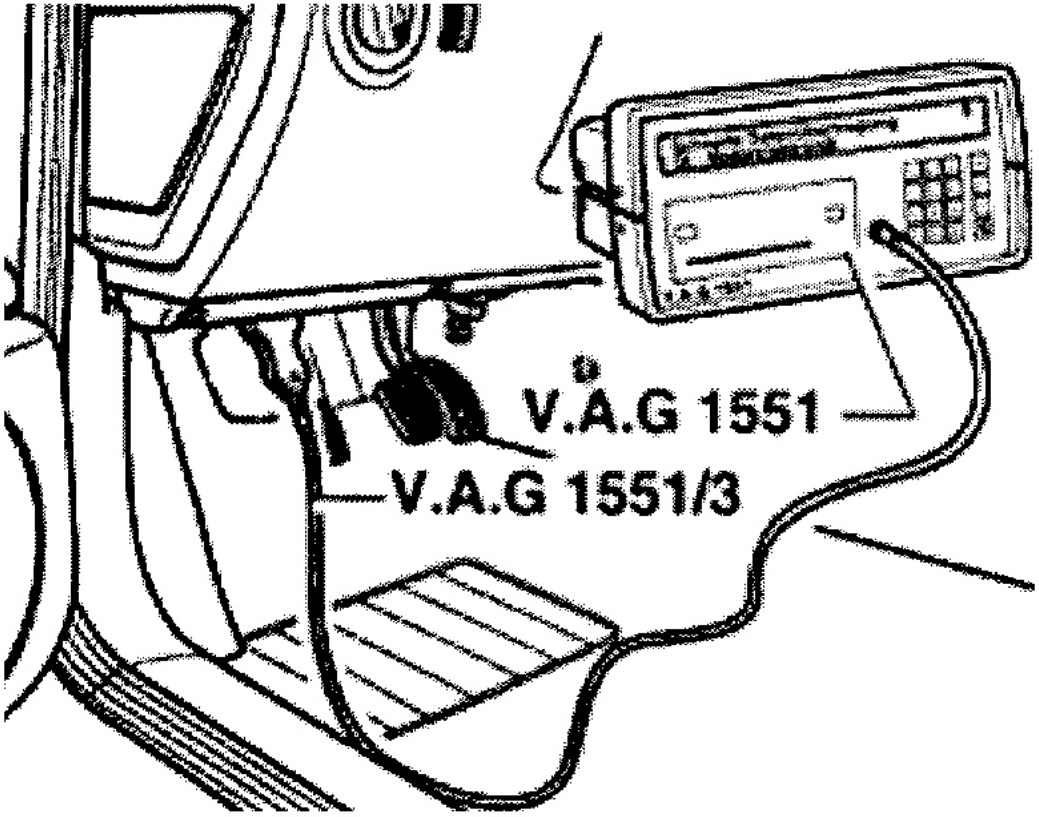


Fig. 21: Removing Reverse Shaft Support Bracket
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Transmissions up to 05.99

- Remove selector shaft with selector mechanism cover; to do this place selector shaft in neutral position. Then remove bolts (arrows) and pull selector shaft out of transmission housing.



G00380862

Fig. 22: Removing Selector Shaft Out Of Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Transmissions as of 06.99

- Remove selector shaft with selector mechanism cover; to do this place selector shaft in neutral position. Then remove bolts -arrows- and pull selector shaft out of transmission housing.

	Selector lever positions	
	D Idle	R Idle
Pressure in bar	3.4 to 3.8	5 to 6

G00387911

Fig. 23: Removing Selector Shaft With Selector Mechanism Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Continuation for all vehicles

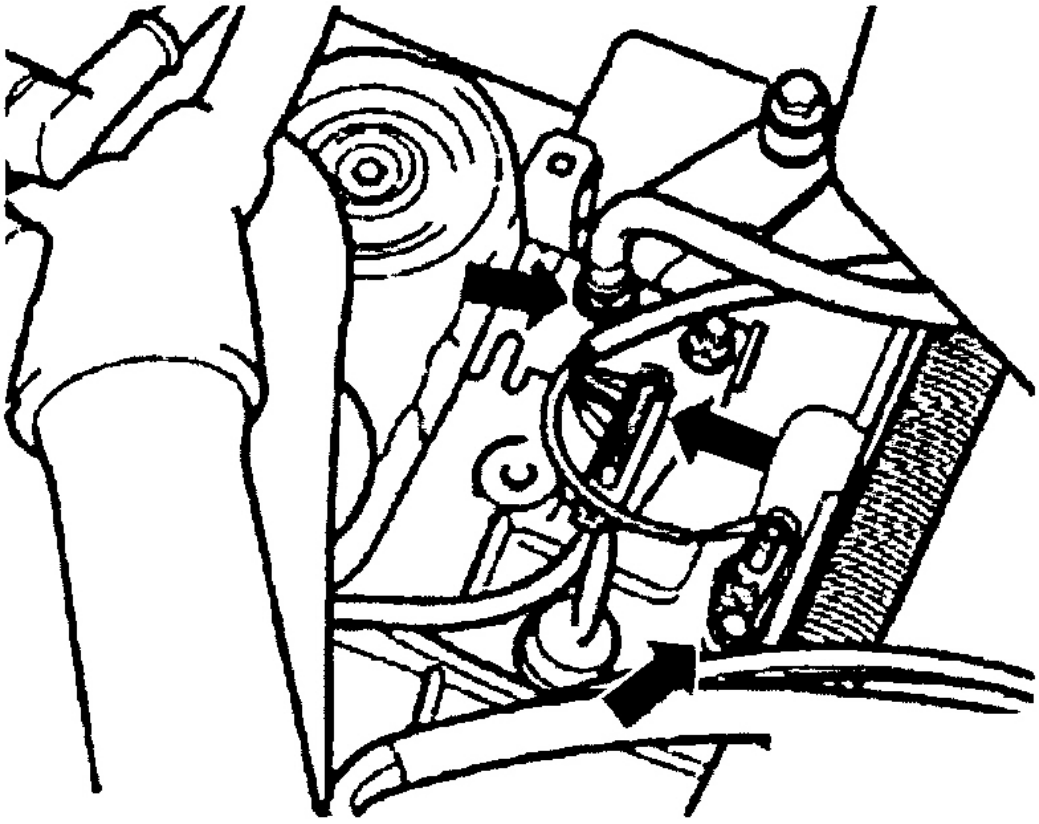
- Remove cover plate -A- and pivot pins -B- from underside of transmission.

Possible causes	Remedy
Idling speed too high	Adjust engine
ATF pump faulty	Check ATF pump and replace if necessary
Sticking valves in valve body	Replace valve body

G00387912

Fig. 24: Removing Cover Plate And Pivot Pins From Underside Of Transmission
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove pivot pins -A- on top side of transmission and transmission housing to clutch housing securing bolts -B- in area of differential.



G00387913

Fig. 25: Removing Top Side Of Transmission And Transmission Housing To Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove bolts -A-, from inside clutch housing for securing clutch housing to transmission housing.

NOTE: Do not remove nuts -B- for output shaft bearing support.

	Selector lever positions and test conditions	
	D Engine speed ca. 2000 rpm	R Engine speed ca. 2000 rpm
Pressure in bar	12.4 to 13.2	23.0 to 24.0

G00387914

Fig. 26: Removing Inside Clutch Housing For Securing Clutch Housing To Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Take off transmission housing, carefully pry up all round and alternating between sides on protruding housing flange (arrows). Be careful not to damage sealing surfaces.

Possible causes	Remedy
ATF pump faulty	Check ATF pump and replace if necessary
Sticking valves in valve body	Replace valve body

G00387915

Fig. 27: Removing Protruding Housing Flange
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove selector forks -A- together with selector plates.

- Unscrew bolt for selector mechanism for reverse gear -B-.

Work steps	completed?
Diagnostic Trouble Code (DTC) Memory: Check using VAS 5051 Tester in mode "Guided Fault Finding".	
Power windows (where applicable): Completely open and close all power windows.	
Radio: Input anti-theft radio code and check radio, CD & tape player functions as applicable.	
Clock: Check and reset to local time.	
All electrical consumers: Check function.	

G00387816

Fig. 28: Removing Selector Forks With Selector Plates
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove nuts for output shaft bearing support. See **ASSEMBLING** , item -B-
- Remove reverse gear -A-, input shaft -B- and output shaft -C- one after other from clutch housing.

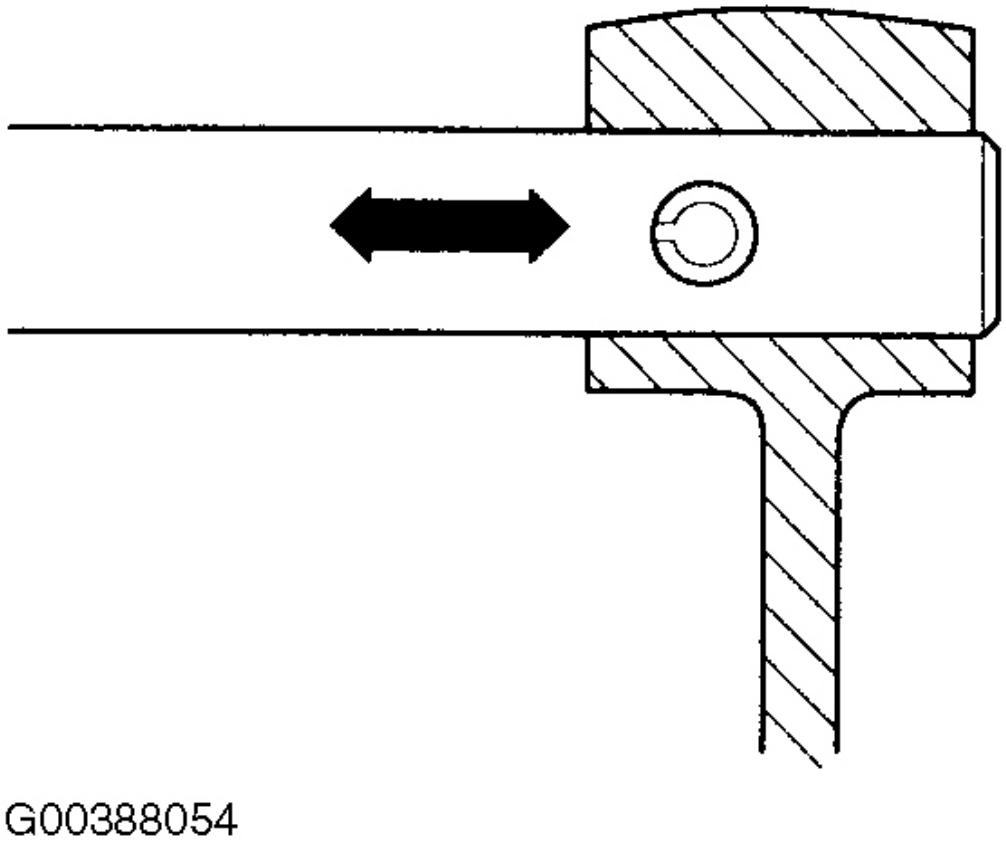
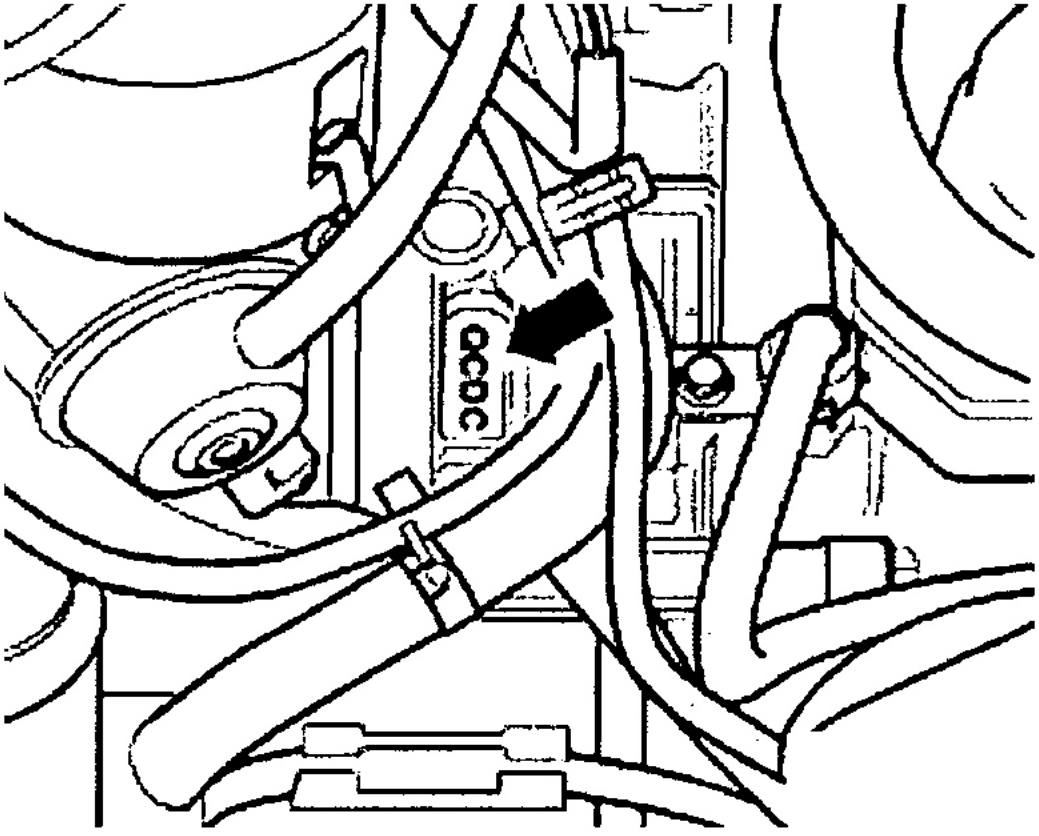


Fig. 29: Removing Reverse Gear, Input Shaft And Output Shaft From Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Take out differential.

Assembling

- Install differential.
- Always replace sealing rings (arrows) for output shaft bearing support.



G00387897

Fig. 30: Installing Sealing Rings To Output Shaft Bearing Support
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The illustration only shows 3 of the 4 sealing rings.

- Install input shaft, output shaft and reverse shaft together.
- Tighten nuts for output shaft bearing support.
- Clean locking fluid remnants from threads in reverse shaft support. See **INSTALLATION POSITION 5TH GEAR WHEEL** . Remnants can be removed using a tap.
- Install reverse shaft support.
- Install selector mechanism/reverse gear.

Installation position reverse gear

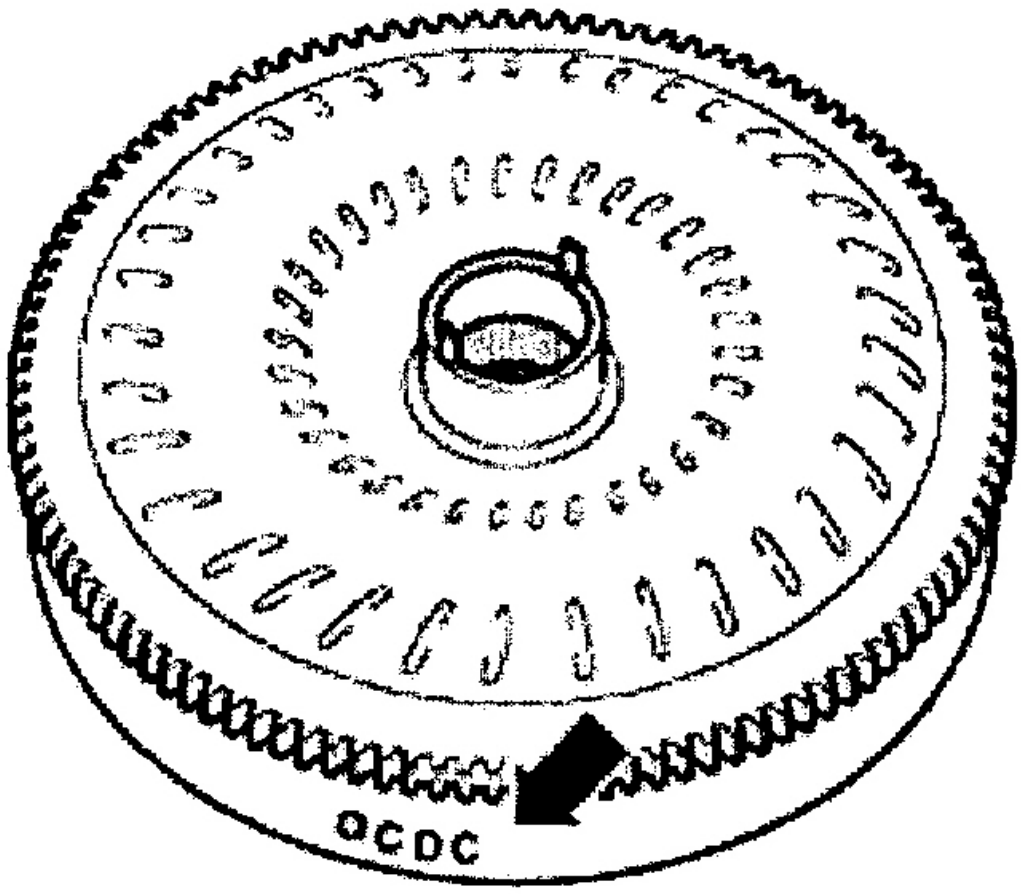


Fig. 31: Installation Position Reverse Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install selector forks together with selector plates.
- Screw M 8 x 100 mm studs -A- into reverse shaft support so that shaft is aligned after installing transmission housing.

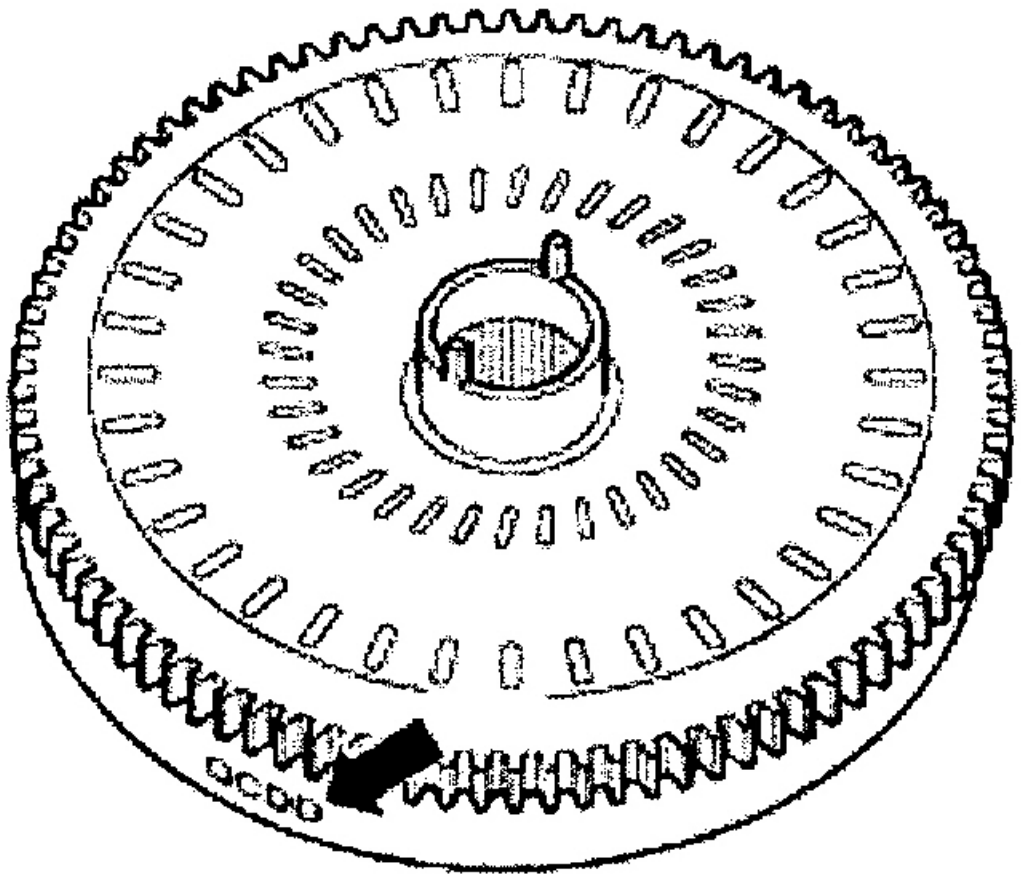


Fig. 32: Identifying Reverse Shaft Into Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Align selector plates.

NOTE: The selector segments must be positioned in the grooves on the locking collars.

- Install transmission housing.

Install reverse shaft support bolts (arrow) as follows:

- Insert bolt -a-, remove stud (see Illustration V34-2s008), insert bolt -b- and hand tighten.

Tightening sequence:

1. Bolt -a- 30 N.m
2. Bolt -b- 30 N.m

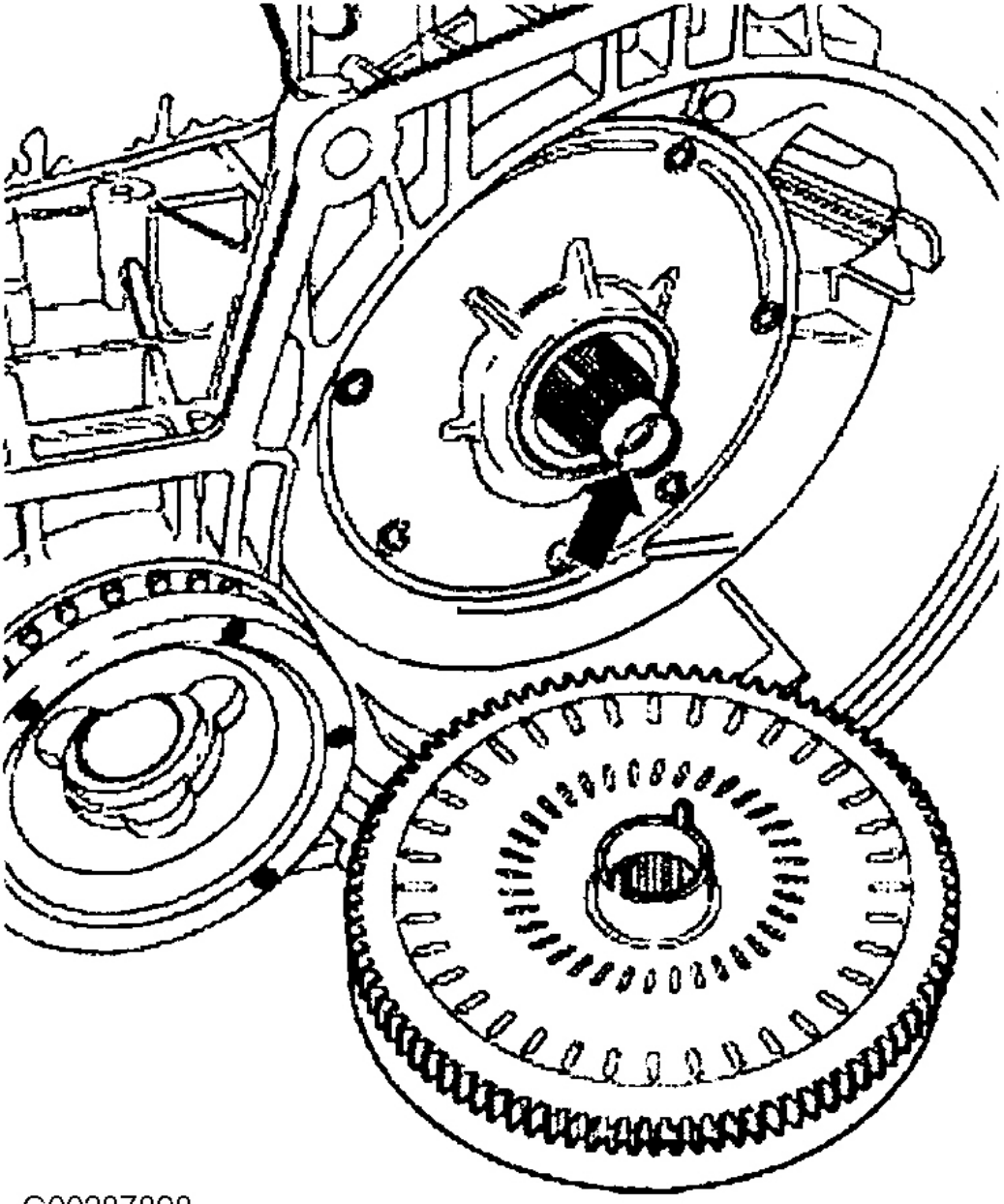


Fig. 33: Sectional View Of Gear Assembly

Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install pivot pin (arrow) for selector forks. To do this align selector mechanism with a screwdriver so that relevant pivot pin can be installed.

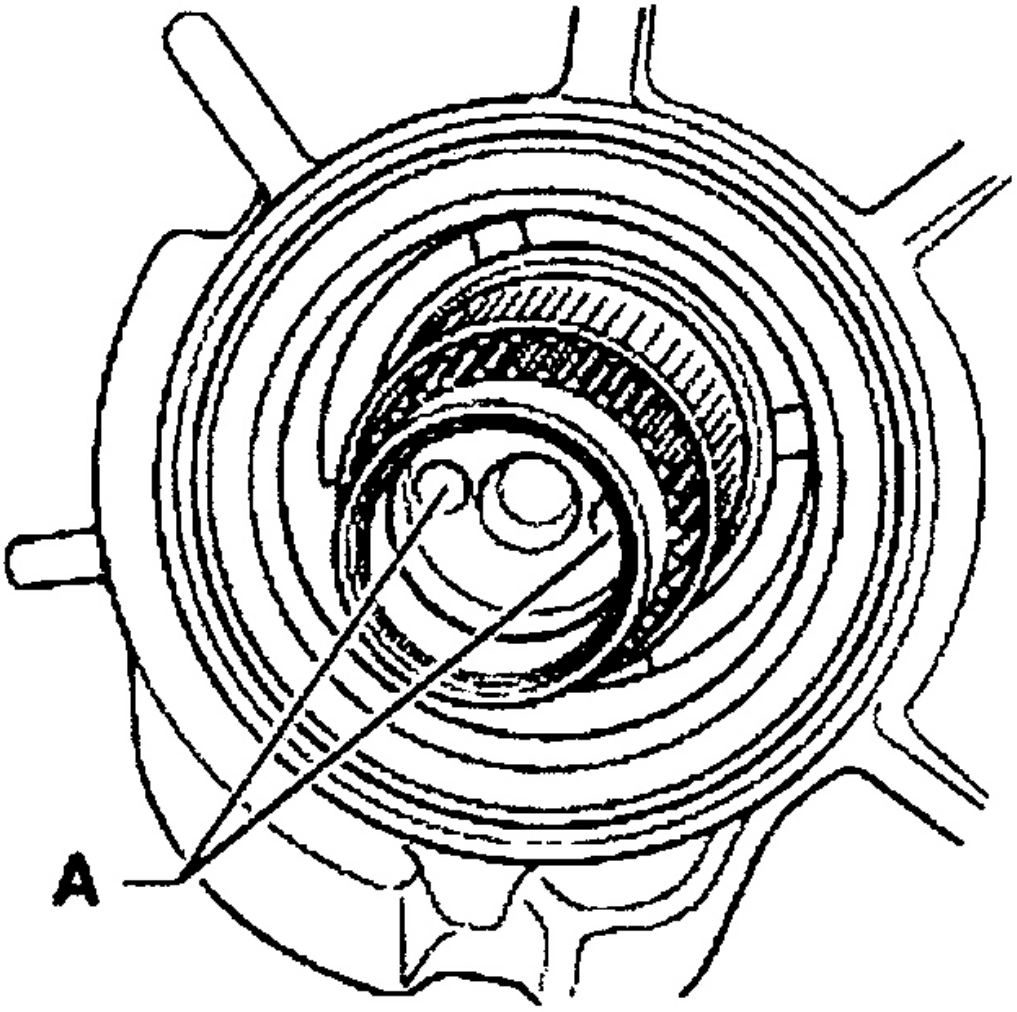


Fig. 34: Installing Pivot Pin
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install selector shaft cover

Install selector shaft as follows:

- Place selector plates in neutral.
- Locate lug (arrow -1-) in recess in transmission housing. Position selector shaft so that selector finger (arrow -2-) is inserted in selector plates.

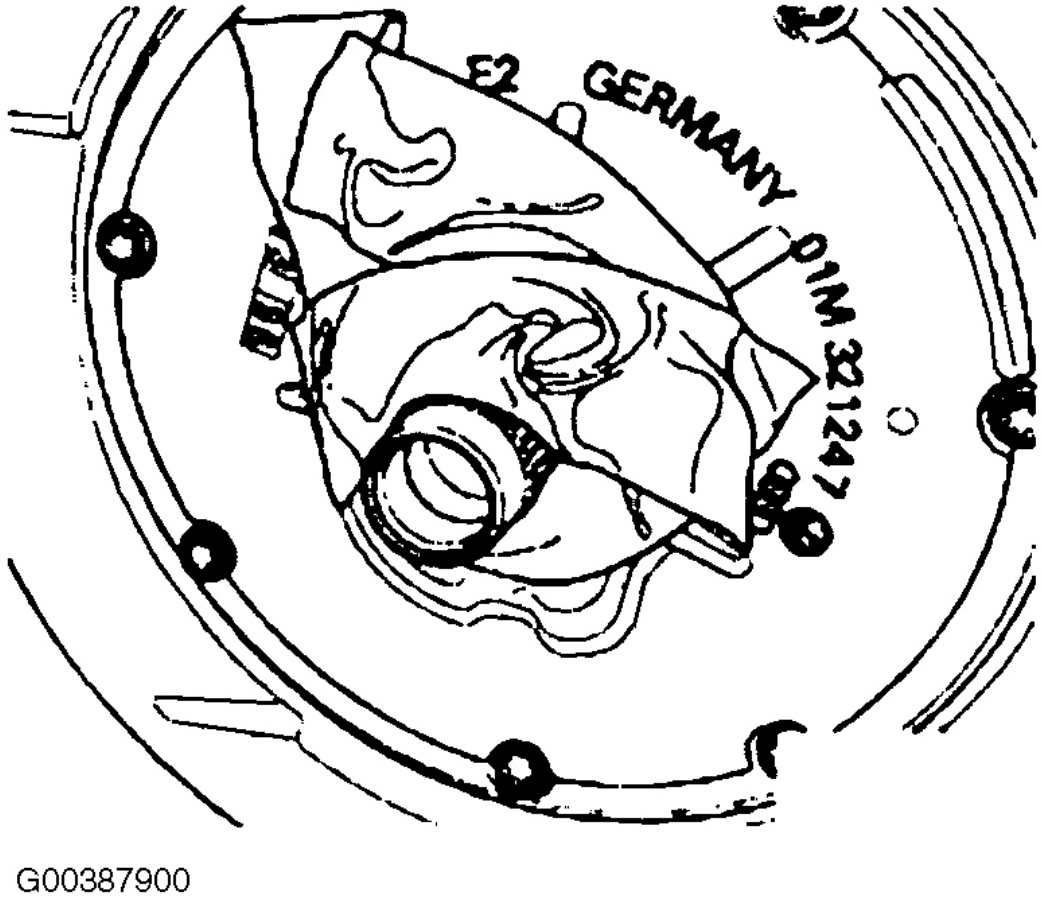
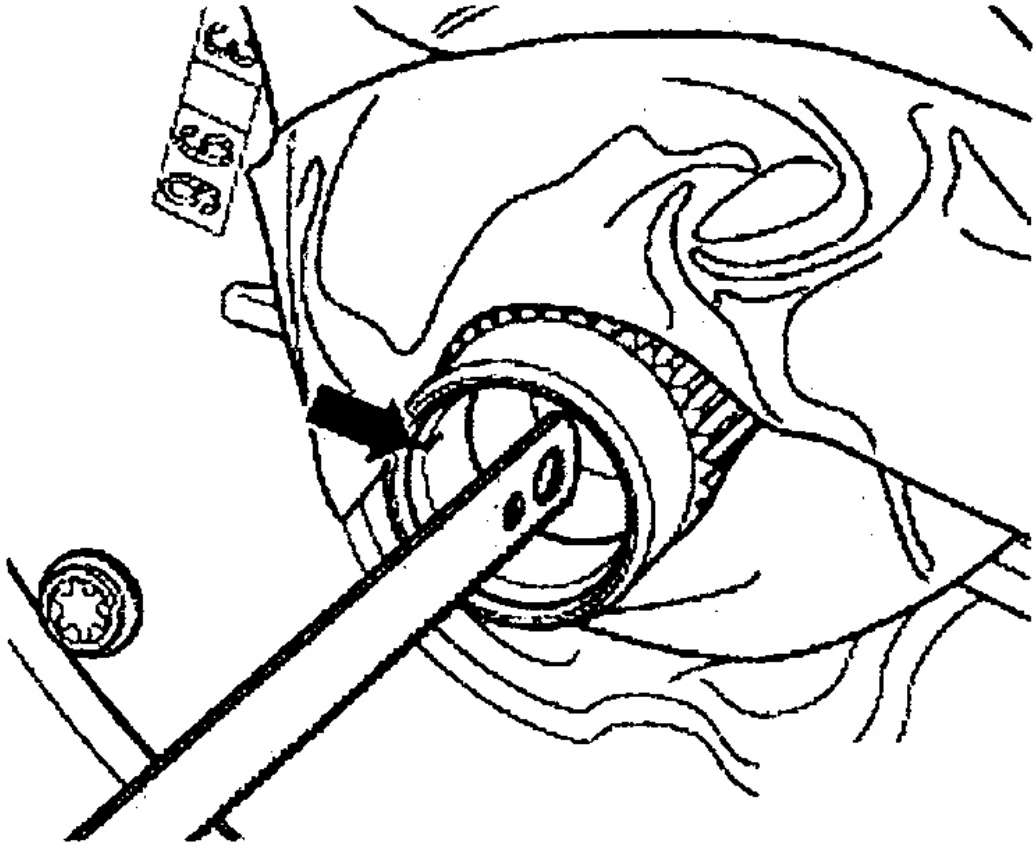


Fig. 35: Installing Selector Shaft
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install selector shaft cover.

Installation position 5th gear wheel

The circumferential groove (arrow) faces to transmission housing.



G00387901

Fig. 36: Identifying Installation Position 5th Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Drive on 5th gear wheel.

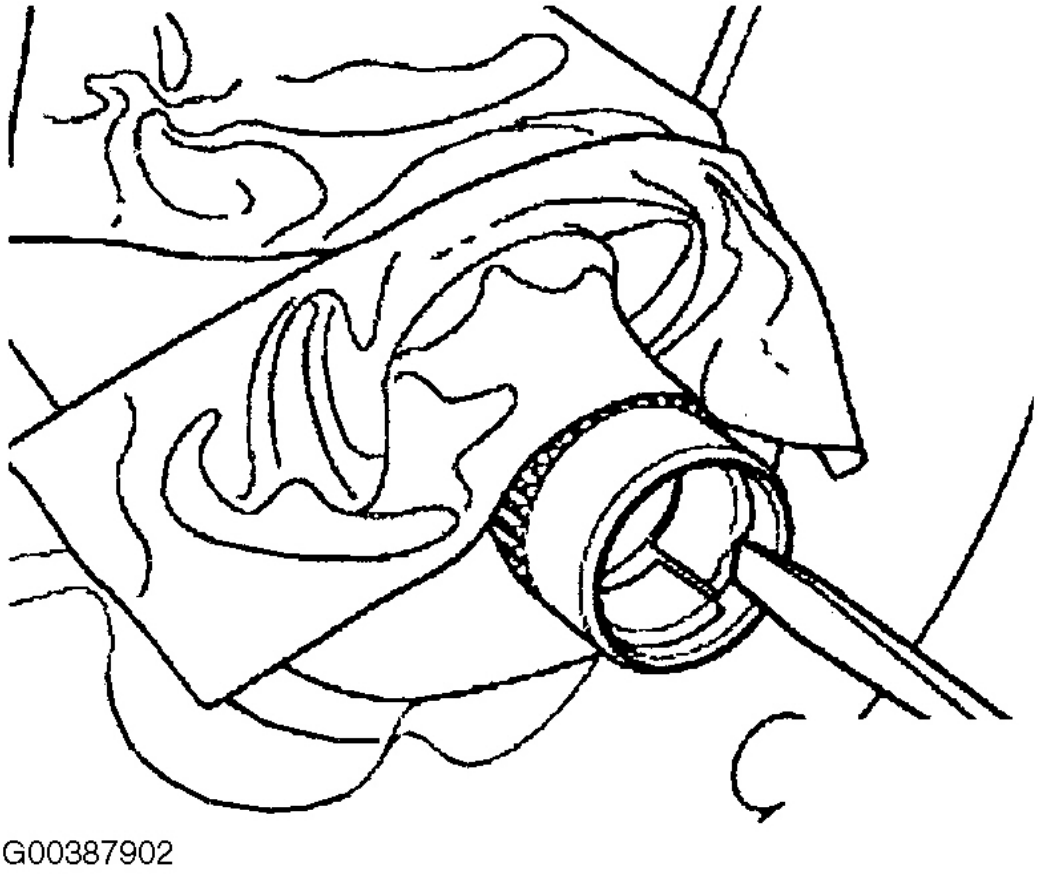


Fig. 37: Installing Drive On 5th Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Checking 5th gear synchro-ring

- Before installing 5th gear wheel and synchro-ring press synchro-ring onto cone of gear wheel and measure gap -a- with a feeler gauge.

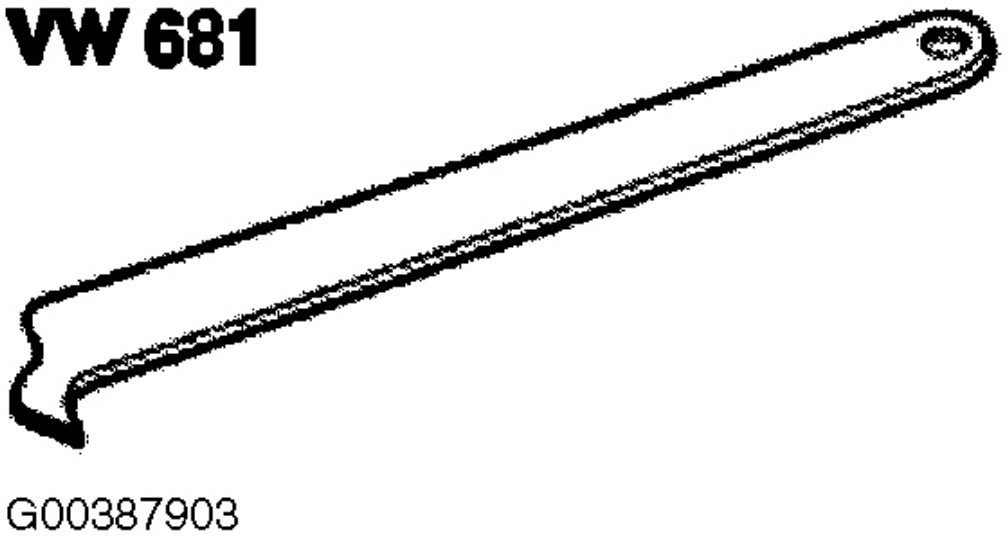


Fig. 38: Measuring Synchro-Ring And Gear Gap
Courtesy of VOLKSWAGEN OF AMERICA, INC.

5TH GEAR SYNCHRO-RING GAP AND WEAR LIMIT

Gap -a-	New	Wear limit
5th gear	1.1... 1.7 mm	0.5 mm

- Install 5th gear wheel with needle roller bearing
- Place 5th gear synchro-ring on gear wheel
- Assembly 5th gear synchro-hub/locking collar before installing. See **Assembling 5th gear locking collar/synchro-hub** .

Installation position 5th gear synchro-hub/locking collar

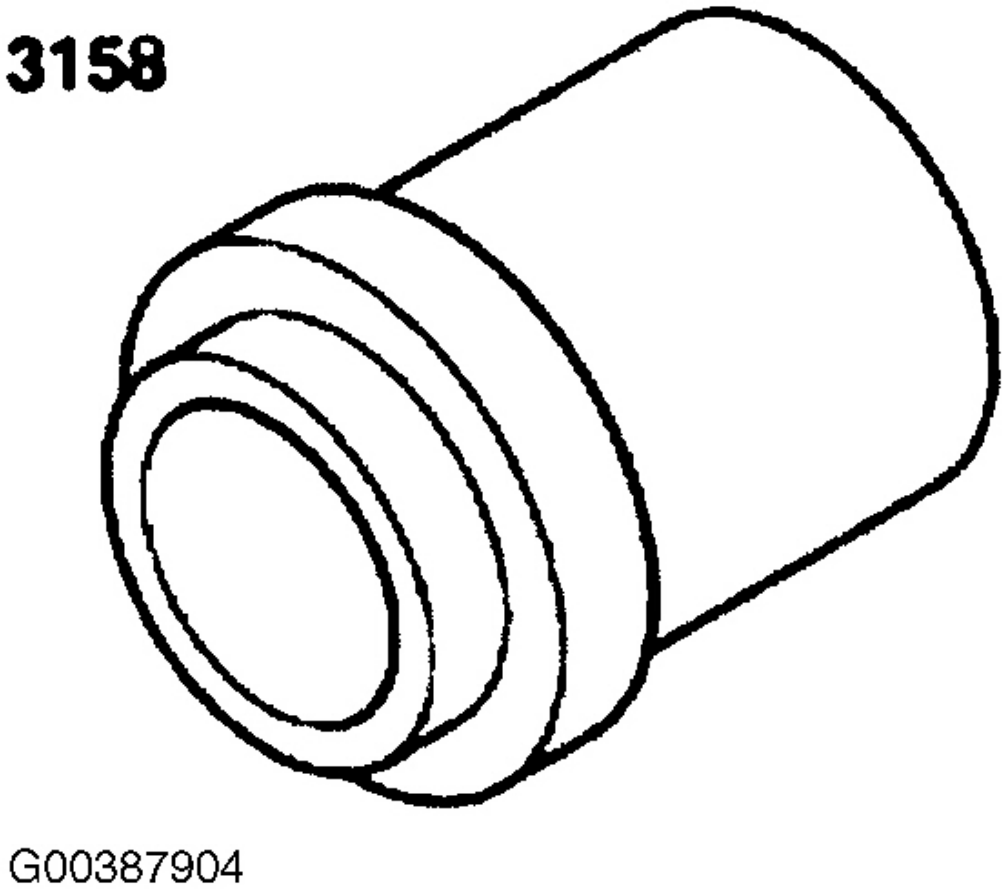


Fig. 39: Identifying Installation Position 5th Gear Synchro-Hub/Locking Collar
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The pointed teeth of the locking collar (arrow -1-) and the high shoulder of the synchro-hub (arrow -2-) face the transmission housing.

The mountings (arrow -3-) of the syncro-hub are inline with the cast locking pieces of the syncro-ring (arrows in **5th gear synchro-ring with cast locking pieces (arrows)**).

5th gear synchro-ring with cast locking pieces (arrows)

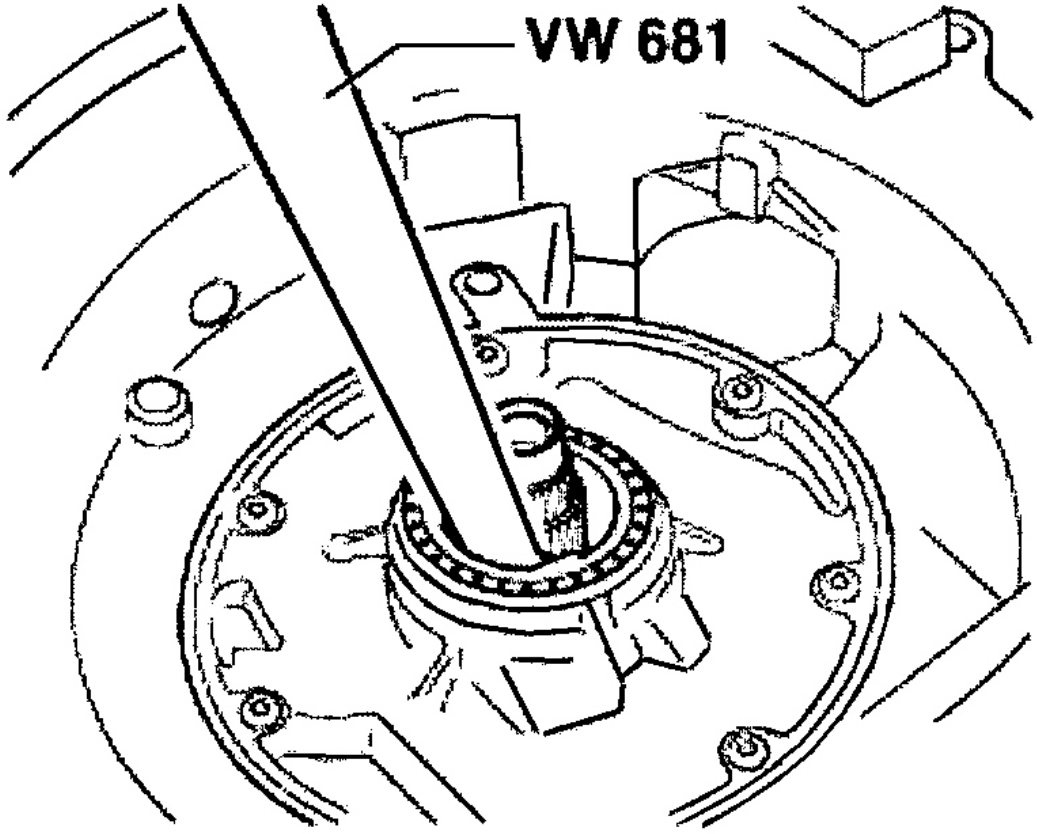


Fig. 40: Identifying 5th Gear Synchro-Ring With Cast Locking Pieces
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Drive on 5th gear synchro-hub

NOTE: When driving make sure synchro-ring is free to move.

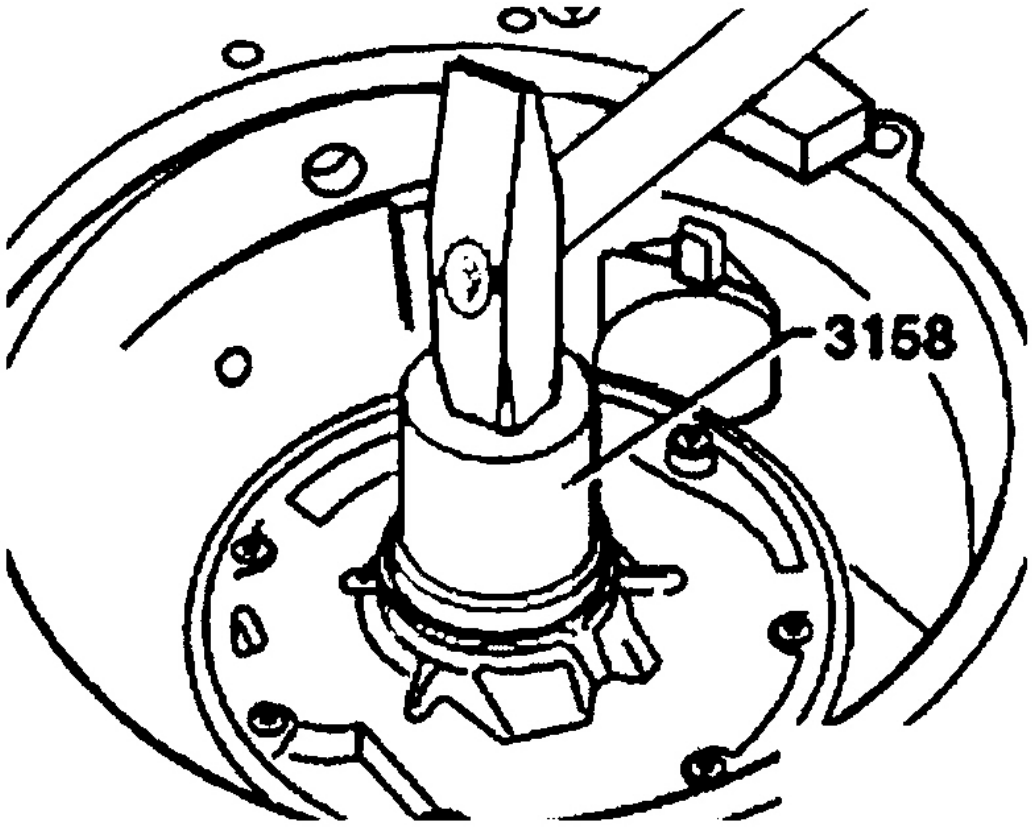


Fig. 41: Installing 5th Gear Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Screw-in securing bolts for synchro-hub and 5th gear wheel.

Installation position of dished spring for gear wheel and 5th gear synchro-hub securing bolts:

The outer diameter (concave side -arrows-) faces 5th gear.

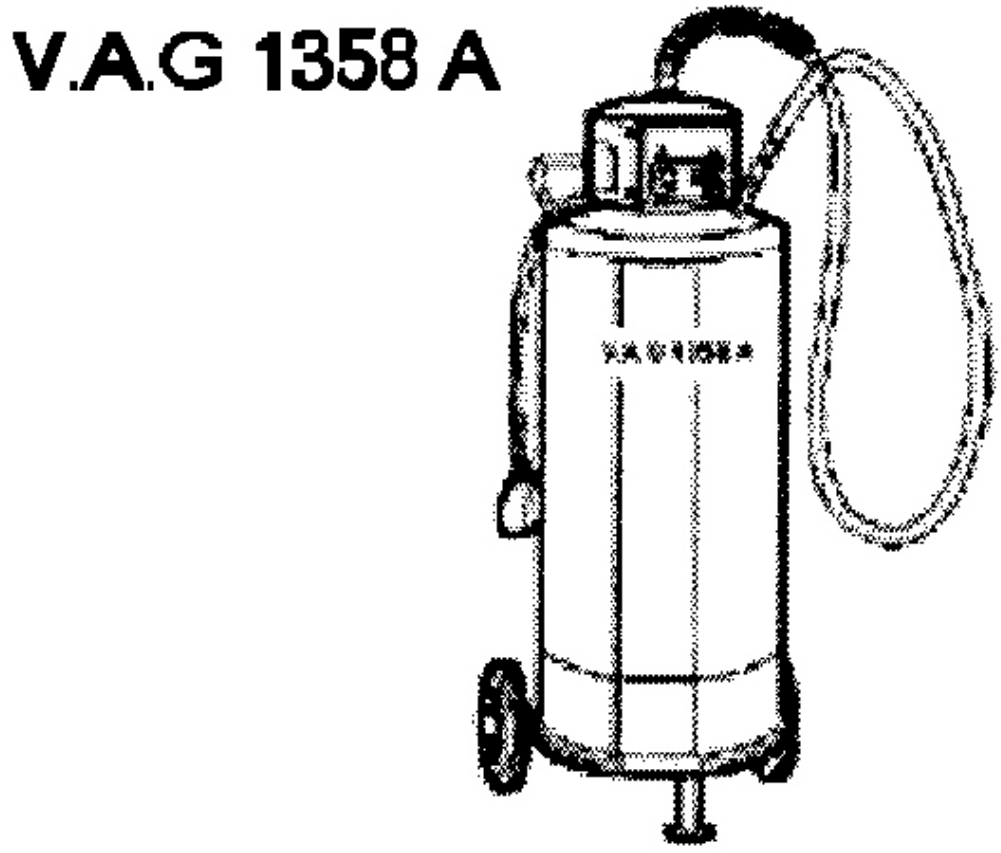


Fig. 42: Locating Outer Diameter Concave Side
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Engage two gears before tightening 5th gear synchro-hub and gear wheel securing bolts (arrows). See **Fig. 22** .
- Install 5th gear selector fork.

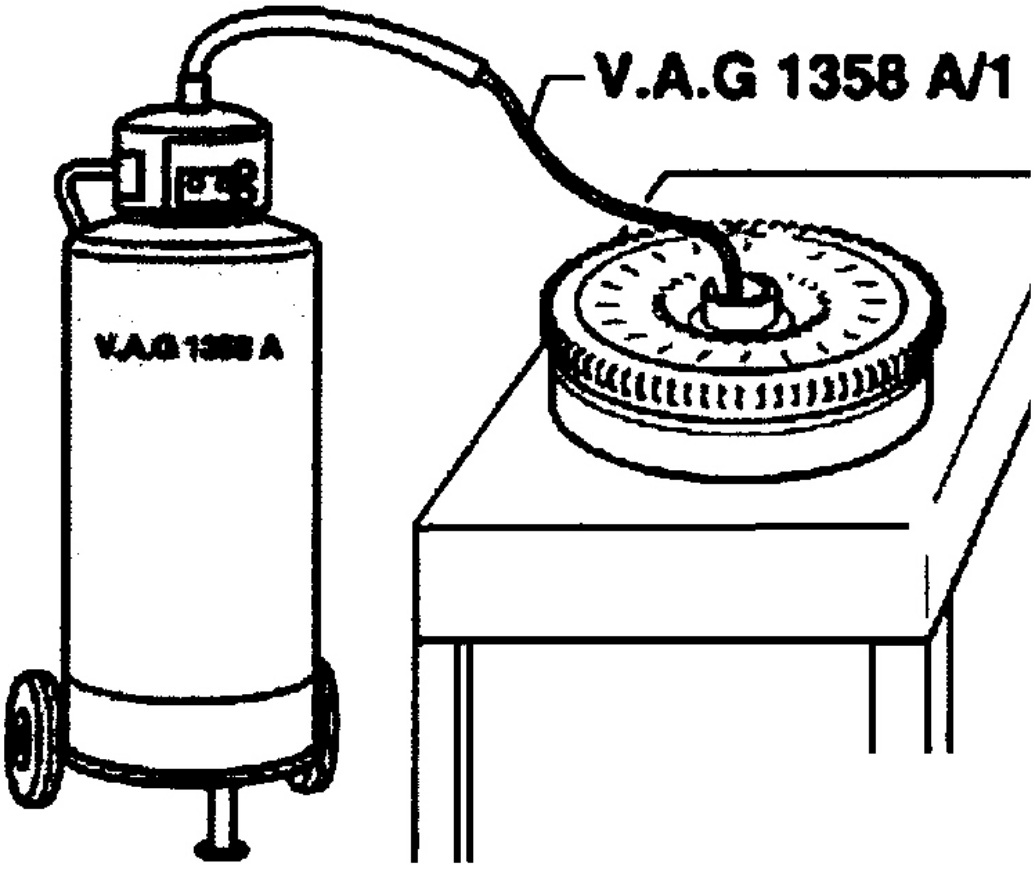
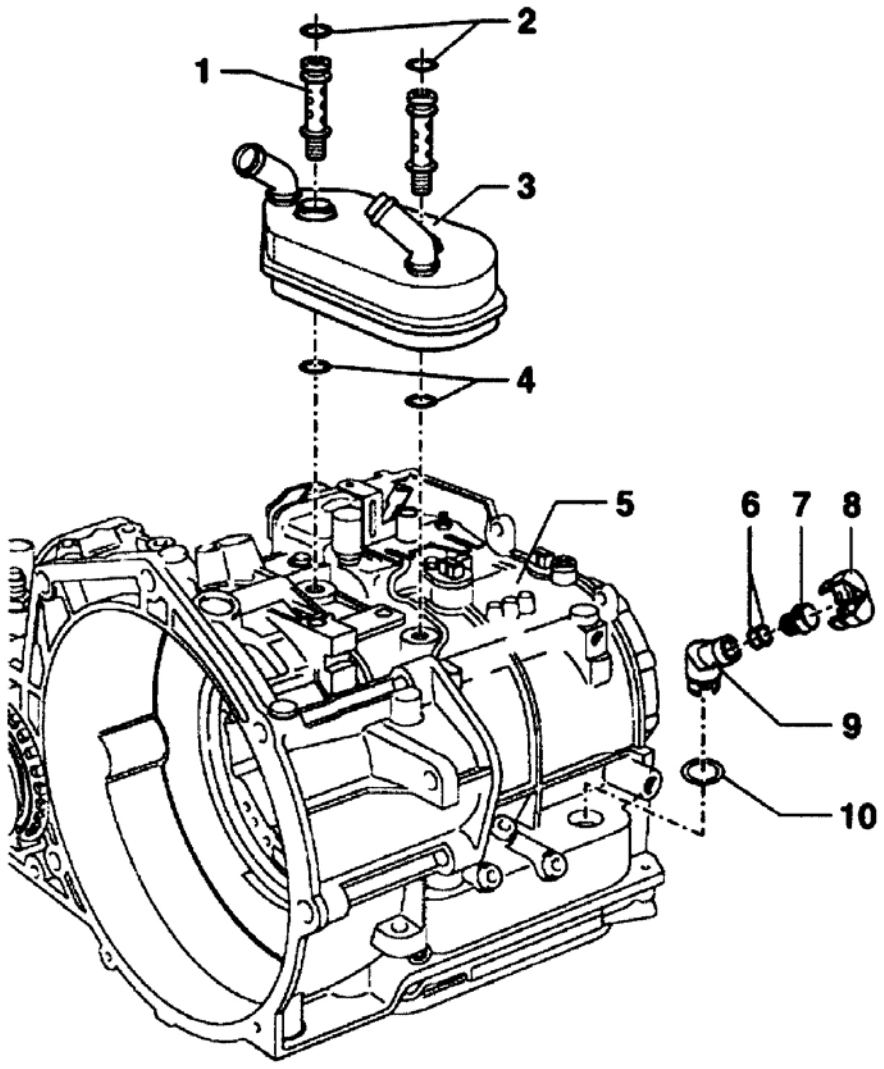


Fig. 43: Tightening 5th Gear Synchro-Hub And Gear Wheel Securing Bolts
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Adjusting 5th gear:

- Engage 5th gear. Loosen bolt -1-. Press locking collar and selector fork jaws in direction of (arrow), then tighten bolt -1- to 25 N.m.



1 - Banjo bolt, 35 Nm
2 - O-ring
♦ Always replace
3 - ATF cooler
4 - O-ring
♦ Always replace
5 - Transmission housing
6 - Seal
♦ Always replace
7 - Plug
8 - Cap
9 - ATF filler tube
10 - O-ring
♦ Always replace

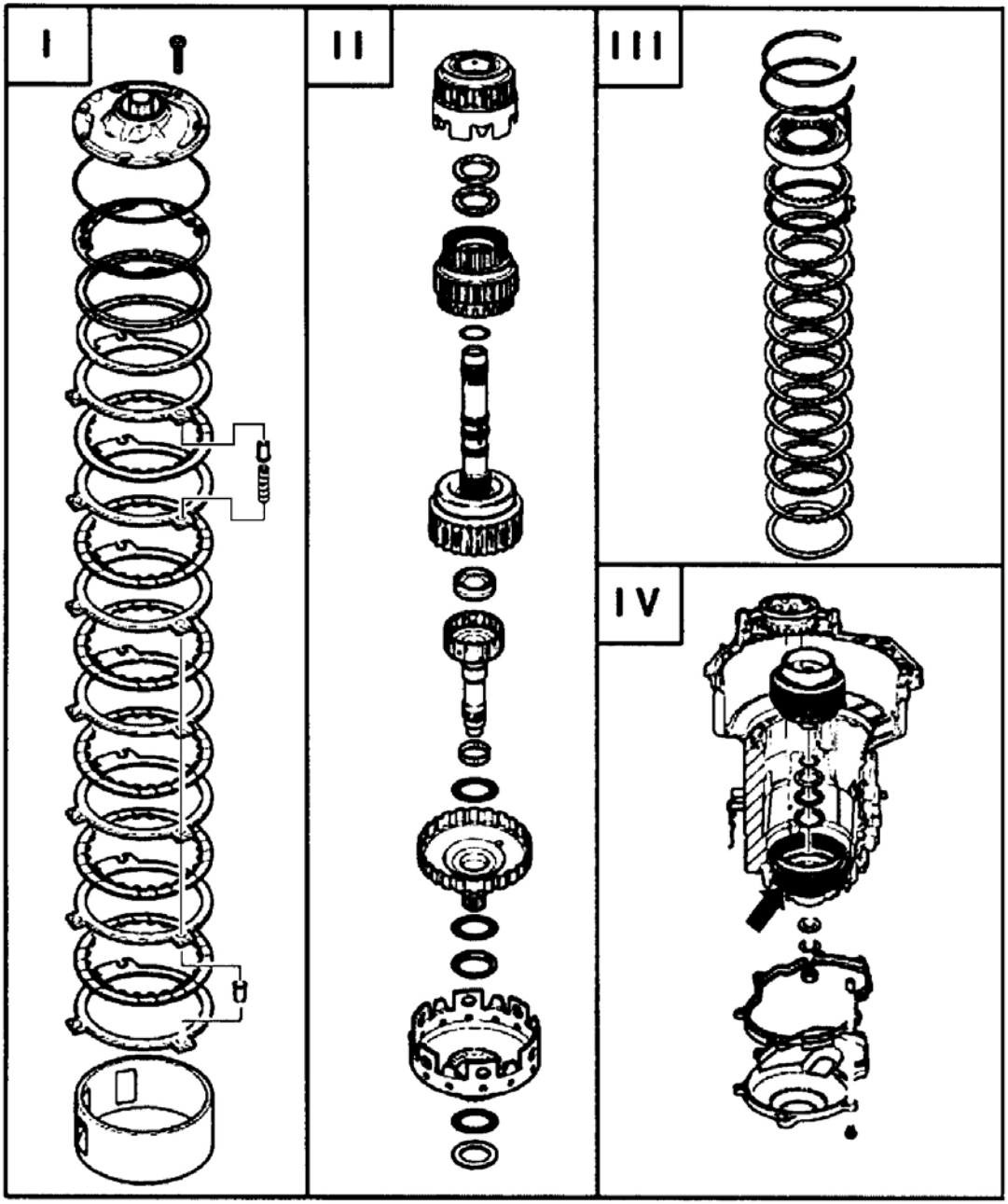
G00387916

Fig. 44: Adjusting 5th Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check measurement: It must not be possible to slide a 0.2 mm feeler gauge between locking collar

and gearwheel. If necessary repeat adjustment.

- Disengage 5th gear. Locking collar must now be in neutral position. Synchro-ring must move freely.
- Select all gears.
- Install transmission housing cover
- Install flange shafts along with springs, thrust washers and tapered rings.



Note: It is not necessary to remove input gear (arrow).

I - ATF Pump To Support Tube
II - Reverse Clutch To Large Sun Gear
III - Freewheel & Reverse Gear Brake
IV - Planet Carrier

G00387917

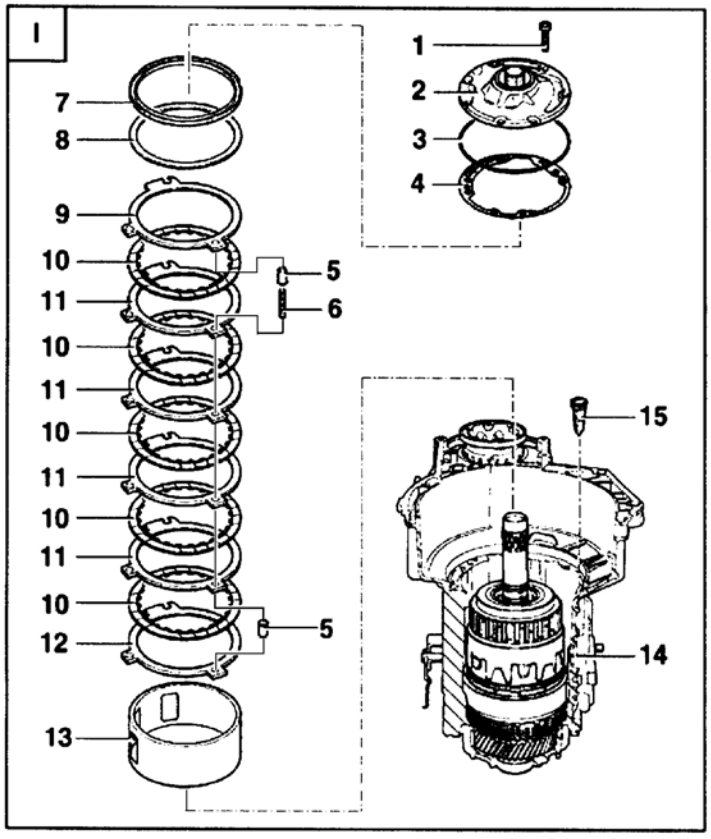
Fig. 45: Installing Flange Shafts
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install release bearing guide sleeve. See **CLUTCH RELEASE BEARING** .
- Install clutch release lever and release bearing. See **CLUTCH RELEASE BEARING** .

TRANSMISSION HOUSING AND CLUTCH HOUSING, SERVICING

Special Tools And Equipment

- VW 295 Drift
- VW 295a Adapter
- VW 447 H Press plate
- VW512 Press disk
- 2040 Tube
- VW 454 Press piece



1 - Bolt
- Qty. 7
- Tighten to 8 Nm and turn 90° further
- The turning further of 90° may be done in several stages

2 - ATF pump with -B2- piston
- Replacement part is assigned according to transmission code letters

3 - O-ring
- Always replace
- Place on ATF pump

4 - Gasket
- Always replace

5 - Spring cap, Qty. 6
- Install 3 spring caps after installing first outer plate
- Install 3 spring caps before installing last outer plate

6 - Spring
- Qty. 3

7 - Retaining ring

8 - Shim

9 - Outer plate -B2-
- 3 mm thick

10 - Inner plate -B2-
- Before installing place new inner plates in ATF for 15 minutes

11 - Outer plate -B2-
- Always install 2 mm thick outer plates

12 - Outer plate -B2-
- Install 3 mm thick outer plate to supporting tube

13 - Supporting tube -B2-
- For -B2- plate package
- Replacement part is assigned according to transmission code letters
- Insert so that groove engages in wedge of freewheel

14 - Transmission housing with clutches installed

15 - Strainer
- Not installed until transmission manufacture date 14 02 0.

G00387918

Fig. 46: Identifying Special Tools And Equipment (1 Of 3)

Courtesy of VOLKSWAGEN OF AMERICA, INC.

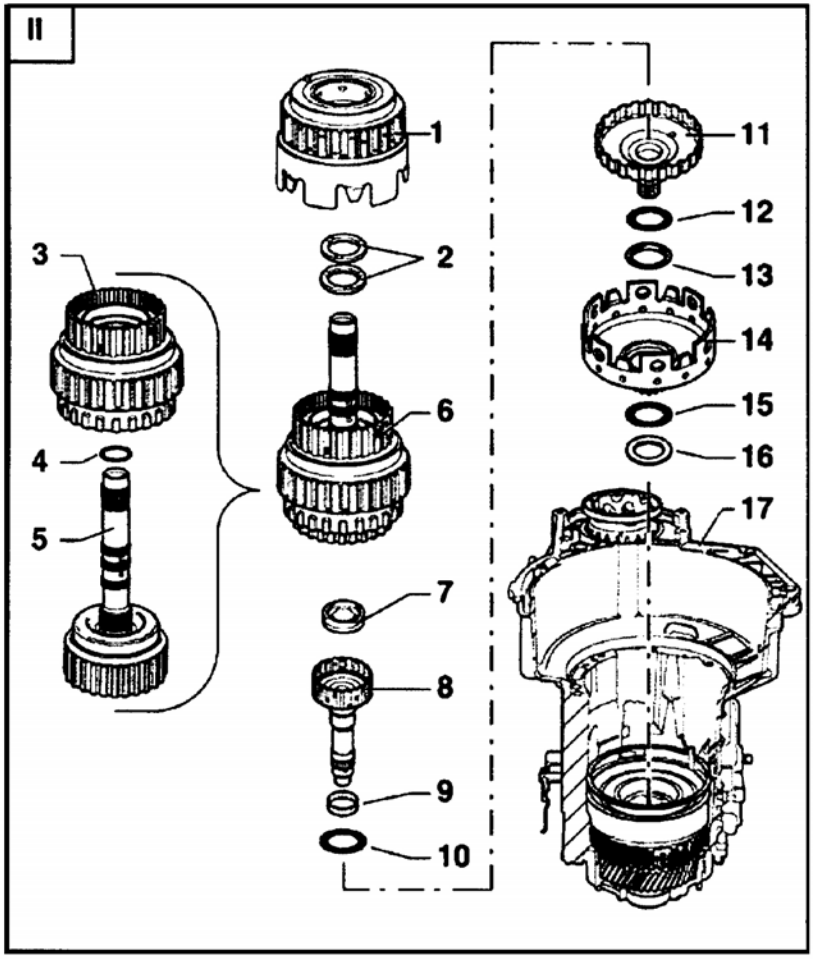
- VW 228 B Extractor
- VW 222 A Drift
- 3066 Spindle from assembly tool

Oil seal and sleeve are driven out in two pieces:

- 3124 Press piece

Oil seal and sleeve are driven out in one piece:

- VW 771 Multipurpose tool
- VW 771/37 Pulling hook



1 - Reverse gear clutch -K2-

2 - Shim

- Determining thickness-
  See CLUTCH PLAY BETWEEN -K1- AND -K2-, ADJUSTING
- 1 or 2 shims can be installed

3 - 1st to 3rd gear clutch -K1-

- Replacement part is assigned according to transmission code letters
- The clutches -K1- and -K3- are pressed together

4 - Seal

- Always replace

5 - 3rd and 4th gear clutch -K3- with turbine shaft

- Replacement part is assigned according to transmission code letters
- The clutches -K1- and -K3- are pressed together

6 - 1st to 3rd gear clutch -K1- with 3rd and 4th gear clutch -K3-

- The clutches -K1- and -K3- are pressed together

7 - Axial needle bearing with washer

- Axial needle bearing faces small input shaft

8 - Small input shaft

9 - Needle bearing

10 - Axial needle bearing

11 - Large input shaft

12 - Axial needle bearing

13 - Axial needle bearing washer

- With shoulder

14 - Large sun wheel

15 - Axial needle bearing

16 - Axial needle bearing washer

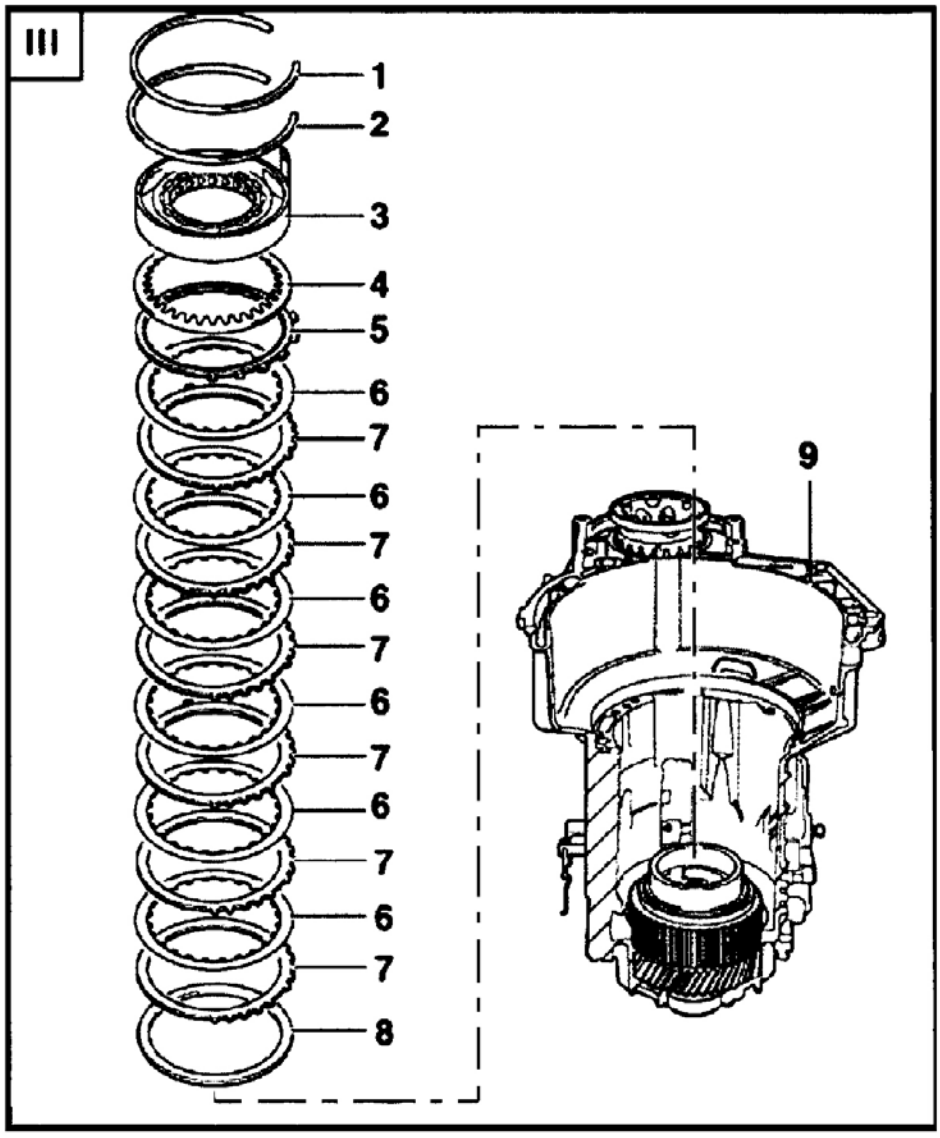
17 - Transmission housing with freewheel and circlips installed

G00387919

Fig. 47: Identifying Special Tools And Equipment (2 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Special tools and equipment

- VW 353 Transmission support



1 - Circlip

- For supporting tube -B2-
- Installation position: Circlip open ends faces freewheel retaining wedge

2 - Circlip

- For freewheel
- Installation position: Circlip open ends faces freewheel retaining wedge

3 - Freewheel with -B1- piston

- Before removing freewheel, remove valve body and sealing plugs

4 - Dished spring

- Install with convex facing freewheel

5 - Pressure plate -B1-

- Install with flat side facing plates
- Replacement part is assigned according to transmission code letters

6 - Inner plate, -B1-

- Before installing place plates in ATF for 15 minutes

7 - Outer plate, -B1-

8 - Shim

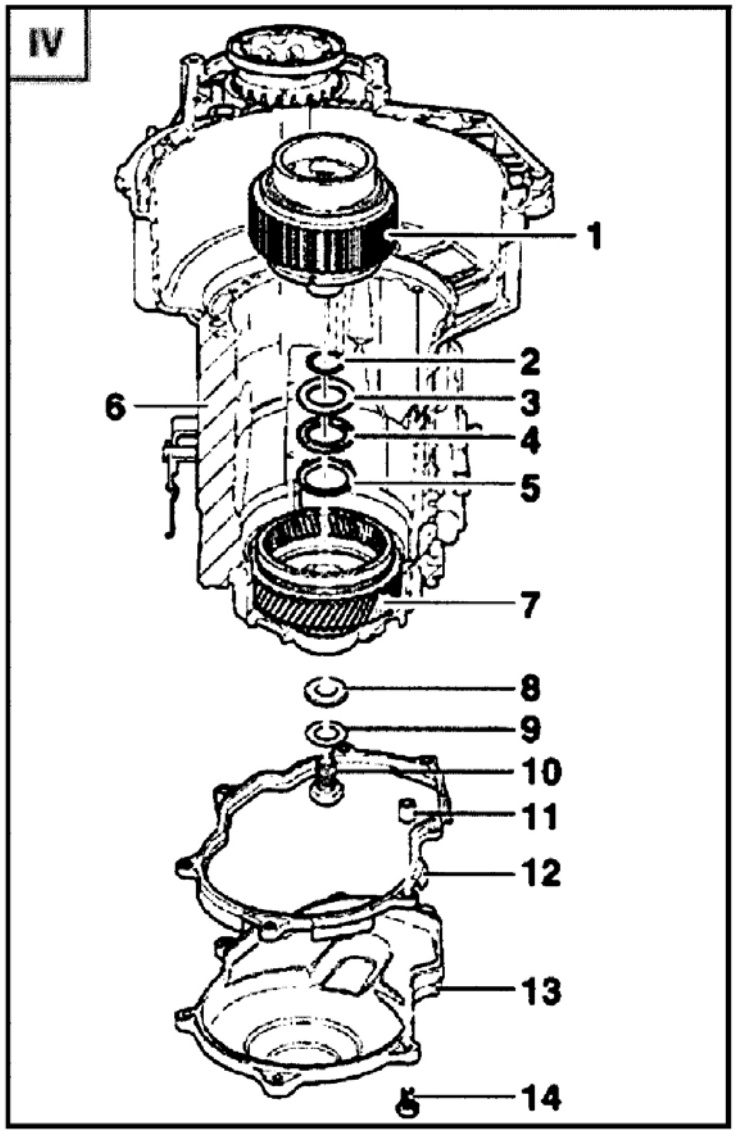
9 - Transmission housing with planet carrier installed

G00387920

Fig. 48: Identifying Special Tools And Equipment (3 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Oil seal and sleeve are driven out in one piece:

- T10148 Press piece



IV - Planet carrier and transmission housing with input gear and cover

1 - Planet carrier

2 - O-ring

- Always replace
- Insert in planet carrier

3 - Axial needle bearing washer

4 - Axial needle bearing

5 - Axial needle bearing washer

- Install smooth side in input gear

6 - Transmission housing with input gear installed

7 - Input gear

- Do not remove to disassemble planetary transmission

8 - Planet carrier shim

9 - Washer

10 - Bolt, 30 Nm

- For small input shaft

11 - Spacer bushing

- Clip qty. 7 into gasket

12 - Gasket

- Always replace

13 - Cover

14 - Bolt, 8 Nm

G00387921

Fig. 49: Identifying T10148 Press Piece
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The following list refers to items in Fig. 50 .

1. **Transmission housing**
   - If replaced: Adjust input shaft and differential. See **Adjustment overview**
2. Needle roller bearing
   - For output shaft
   - Removing. See **Driving out needle roller bearing**
   - Installing and securing. See **Driving needle roller bearing in onto stop**
3. **Oil filler plug, 30 N.m**
   - Without magnet
4. **Shim**
   - For input shaft
   - Adjustment overview. See **Adjustment overview**
5. **Outer race/tapered roller bearing**
   - For output shaft
   - Removing and installing. See **Output shaft, disassembling and assembling**
   - If replaced: Adjust output shaft. See **Output shaft, adjusting**
6. **Outer race/tapered roller bearing**
   - For input shaft
   - Removing and installing. See **Output shaft, disassembling and assembling**
   - If replaced: Adjust input shaft. See **Output shaft, adjusting**
7. **Shim**
   - For input shaft
   - Adjustment overview. See **Adjustment overview**
8. **Outer race/tapered roller bearing**
   - For input shaft
   - Removing and installing. See **Pressing out tapered roller bearing outer race**
   - If replaced: Adjust input shaft. See **Input shaft, adjusting**
9. **Needle bearing**
   - Removing and installing. See **Pulling needle roller bearing out of clutch housing**
10. **Dowel sleeve**
    - (Qty. 2)
11. **Starter bushing**
    - Not installed in all transmissions
    - Pulling out. See **Pulling out starter bushing** .

- Driving in. See **Driving bushing for starter in flush**
- Can be replaced without removing transmission

12. **Clutch housing**
    - If replaced: Adjustment overview. See **Adjustment overview**
13. **Guide sleeve**
    - With input shaft seal and a vulcanized O-ring
    - Driving-out oil seal. See **Driving oil seal out of guide sleeve**
    - Driving-in oil seal. See **Drive oil seal into guide sleeve onto stop**
    - Remove guide sleeve to change oil seal
    - If damaged replace guide sleeve and O-ring together
14. **Socket head bolt, 20 N.m**
    - Self-locking
    - Always replace
15. **Oil seal**
    - Replacing with installed transmission. See **FLANGE SHAFT OIL SEALS (TRANSMISSION INSTALLED), REPLACING**
16. **Sleeve**
    - For oil seal (Item 15)
    - Removing. See **Prying sleeve out with a screwdriver**
    - Installing. See **Pulling sleeve in**
17. **One piece oil seal and sleeve**
    - With damaged oil seal, replace both oil seal and sleeve
    - Removing. See **Pulling out sleeve and oil seal**
    - Installing. See **Driving in sleeve and oil seal**
18. **Speedometer drive**
    - For aluminum tighten to 30 N.m
    - For synthetic material tighten to 10 N.m
19. **Oil drain plug, 30 N.m**
    - Without magnet
20. **Outer race/tapered roller bearing**
    - For differential
    - Pressing in and out. See **Differential, disassembling and assembling**
    - If replaced: Adjust differential. See **Differential, adjusting**
21. **Magnet**
    - Held in place by housing joint surface
22. **Outer race/tapered roller bearing**
    - For differential

- Pressing in and out. See **Differential, disassembling and assembling**
- If replaced: Adjust differential. See **Differential, adjusting**

23. **Shim**
    - For differential
    - Adjustment overview. See **Adjustment overview**
24. **Oil seal**
    - Replacing. See **FLANGE SHAFT OIL SEALS (TRANSMISSION INSTALLED), REPLACING**

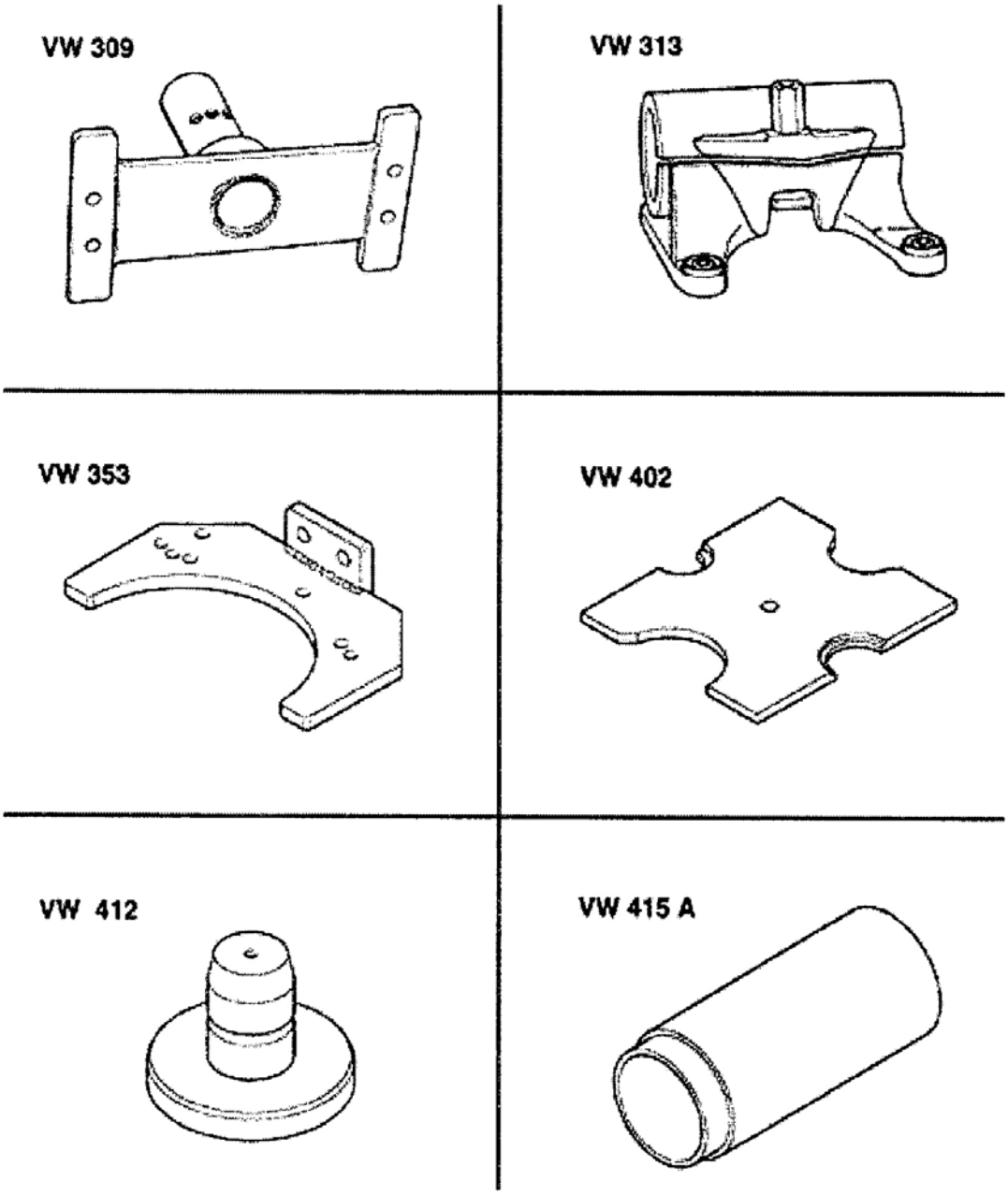


Fig. 50: Exploded View Of Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Driving out needle roller bearing

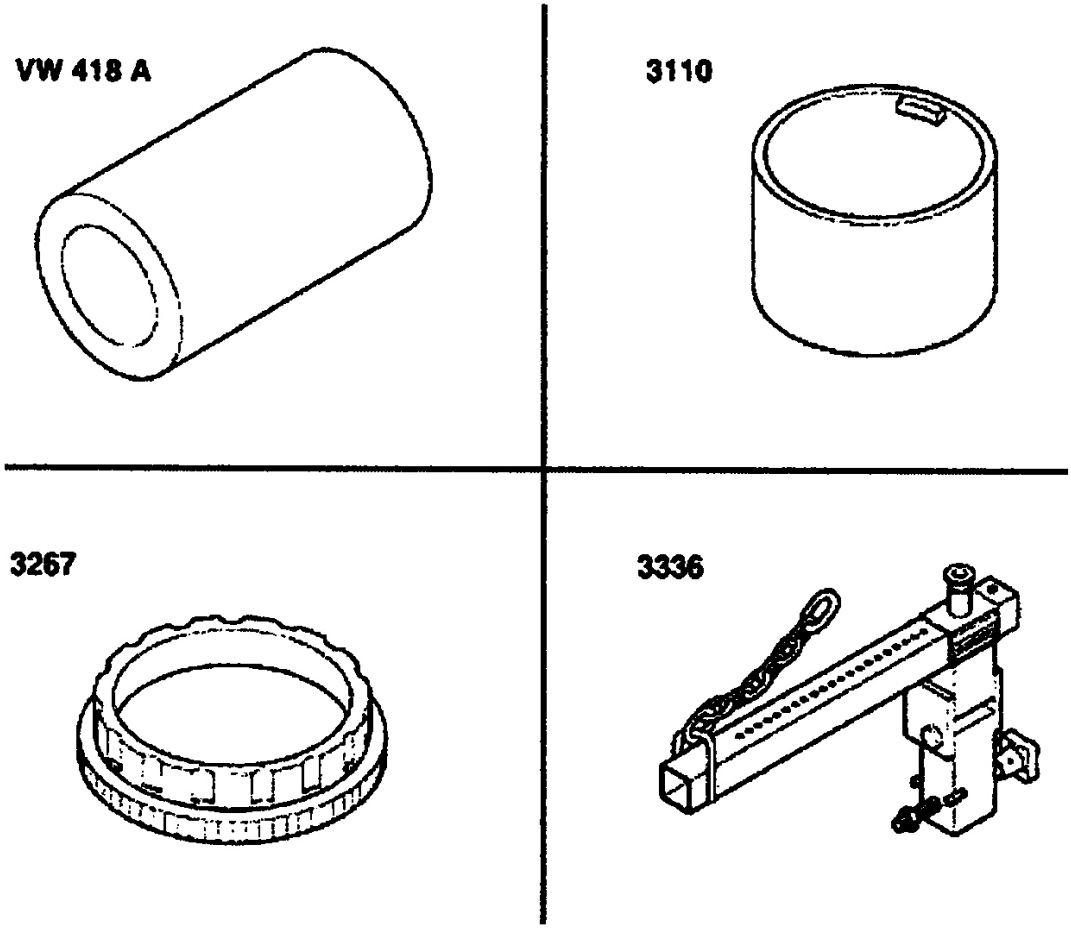


Fig. 51: Driving Out Needle Roller Bearing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Driving needle roller bearing in onto stop

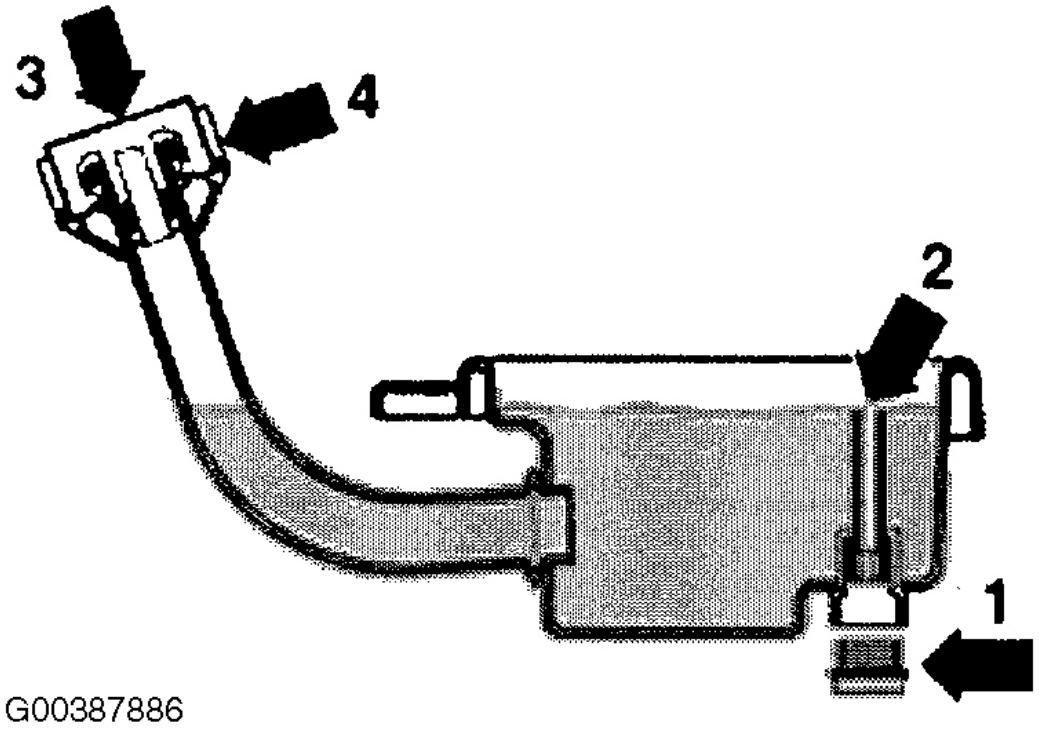


Fig. 52: Driving Needle Roller Bearing In Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Secure needle roller bearing in transmission housing at three points (120° offset) with a punch.

Driving oil seal out of guide sleeve

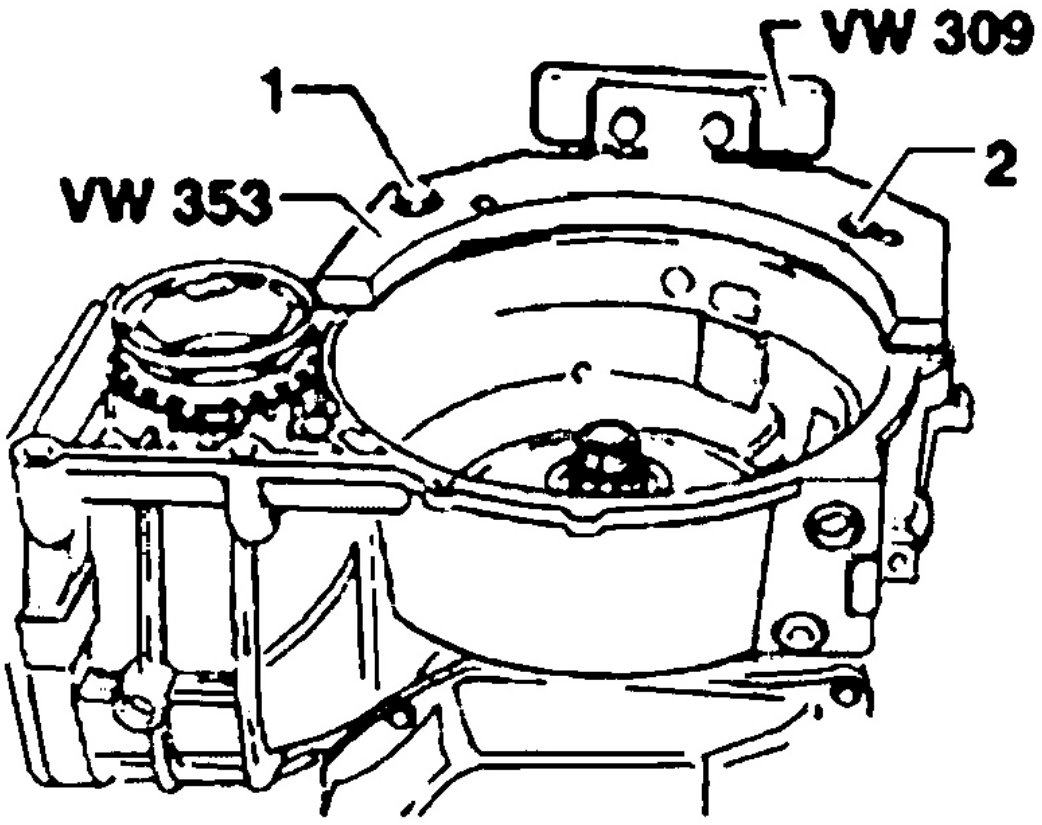


Fig. 53: Driving Oil Seal Out Of Guide Sleeve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Drive oil seal into guide sleeve onto stop

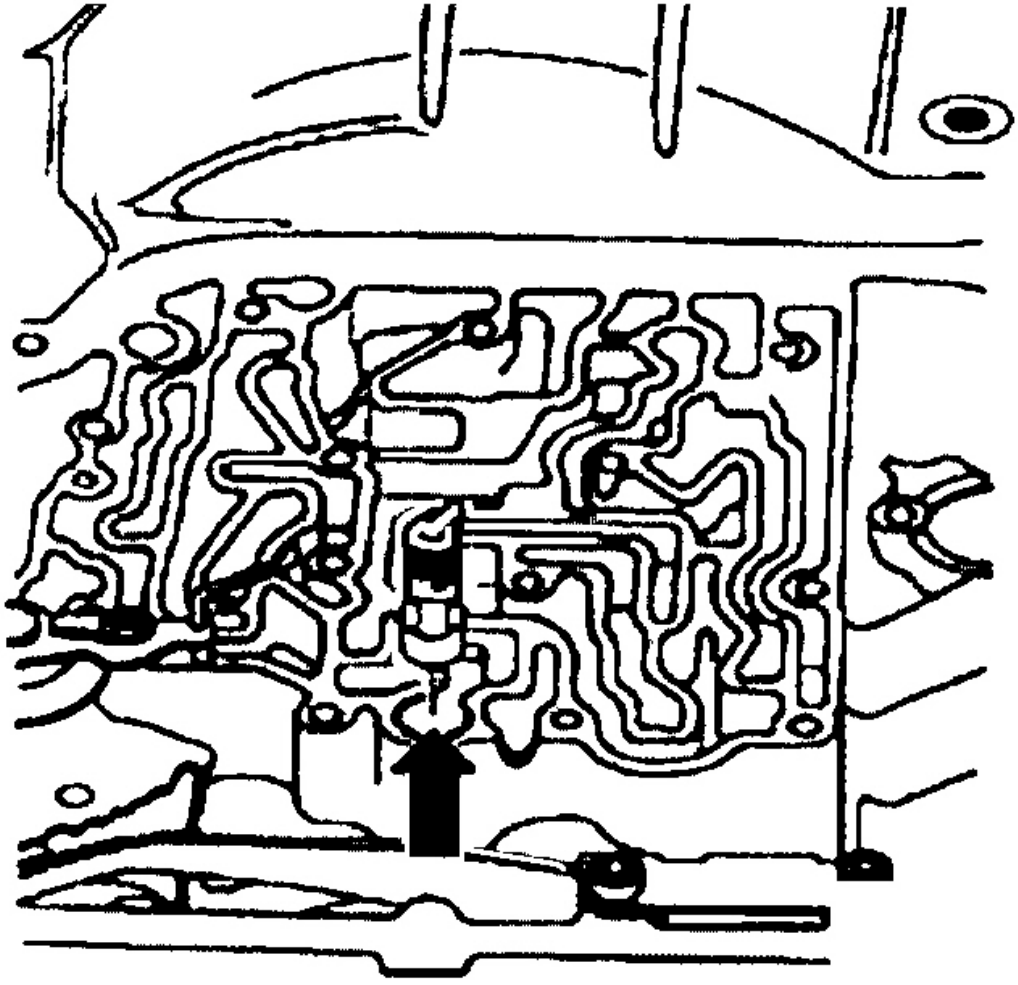


Fig. 54: Driving Oil Seal Into Guide Sleeve Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling out starter bushing

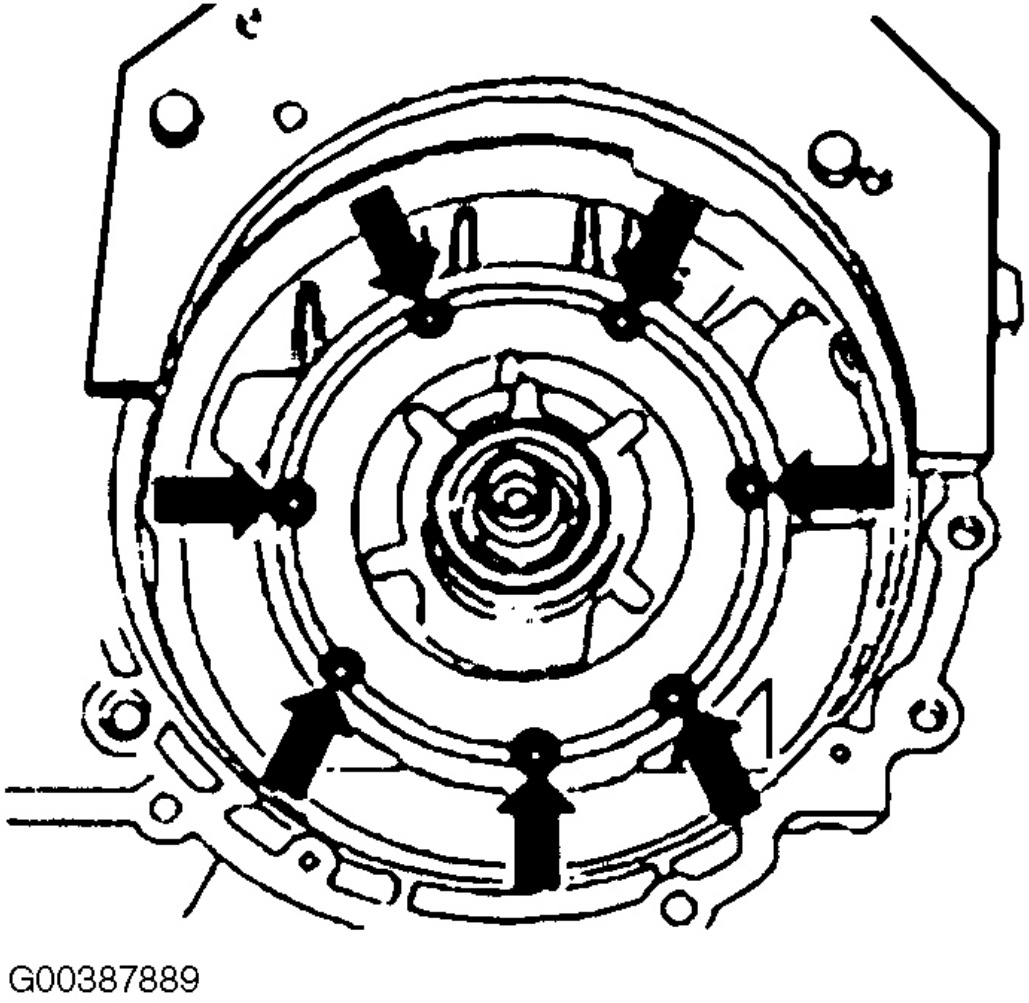


Fig. 55: Pulling Out Starter Bushing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Mounting sequence from extractor VW 228 b

- Turn the nut on the thread of the extractor in direction of tensioning bolt as far as possible.
- Install extractor VW 228 b onto stop.
- Now tighten tensioning bolt until the extractor VW 228 b is tensioned with the bushing.

Driving bushing for starter in flush

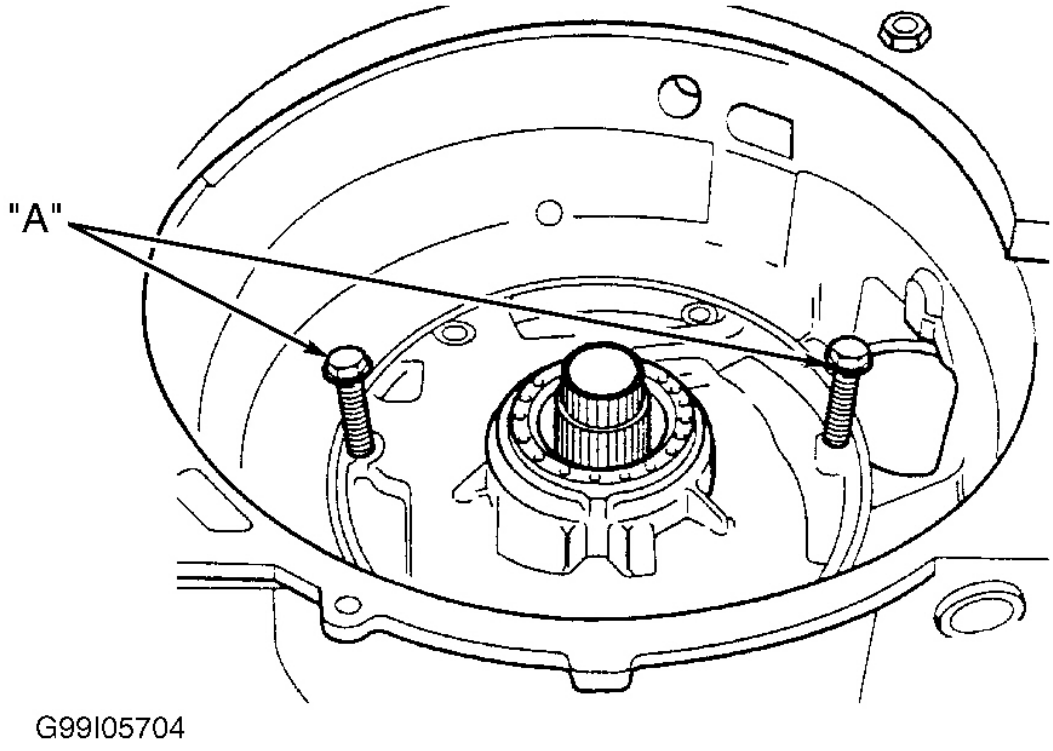
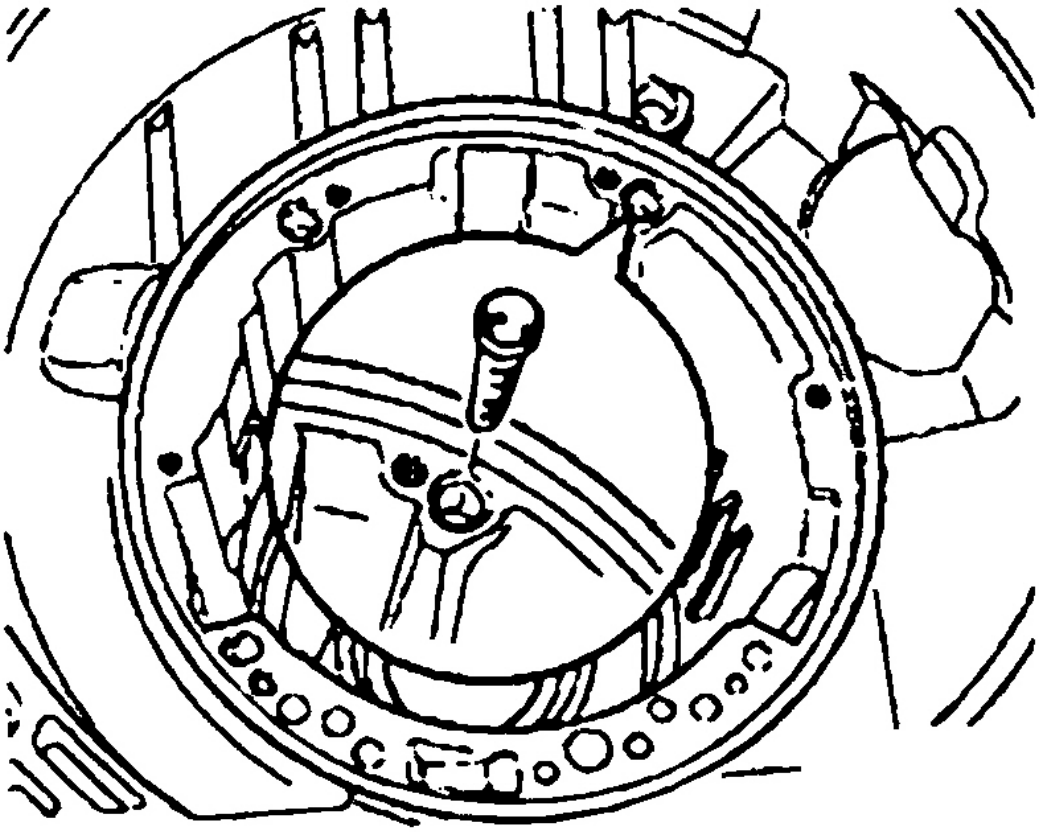


Fig. 56: Driving Bushing For Starter In Flush
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Prying sleeve out with a screwdriver



G00387890

Fig. 57: Prying Sleeve Out With Screwdriver
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling sleeve in

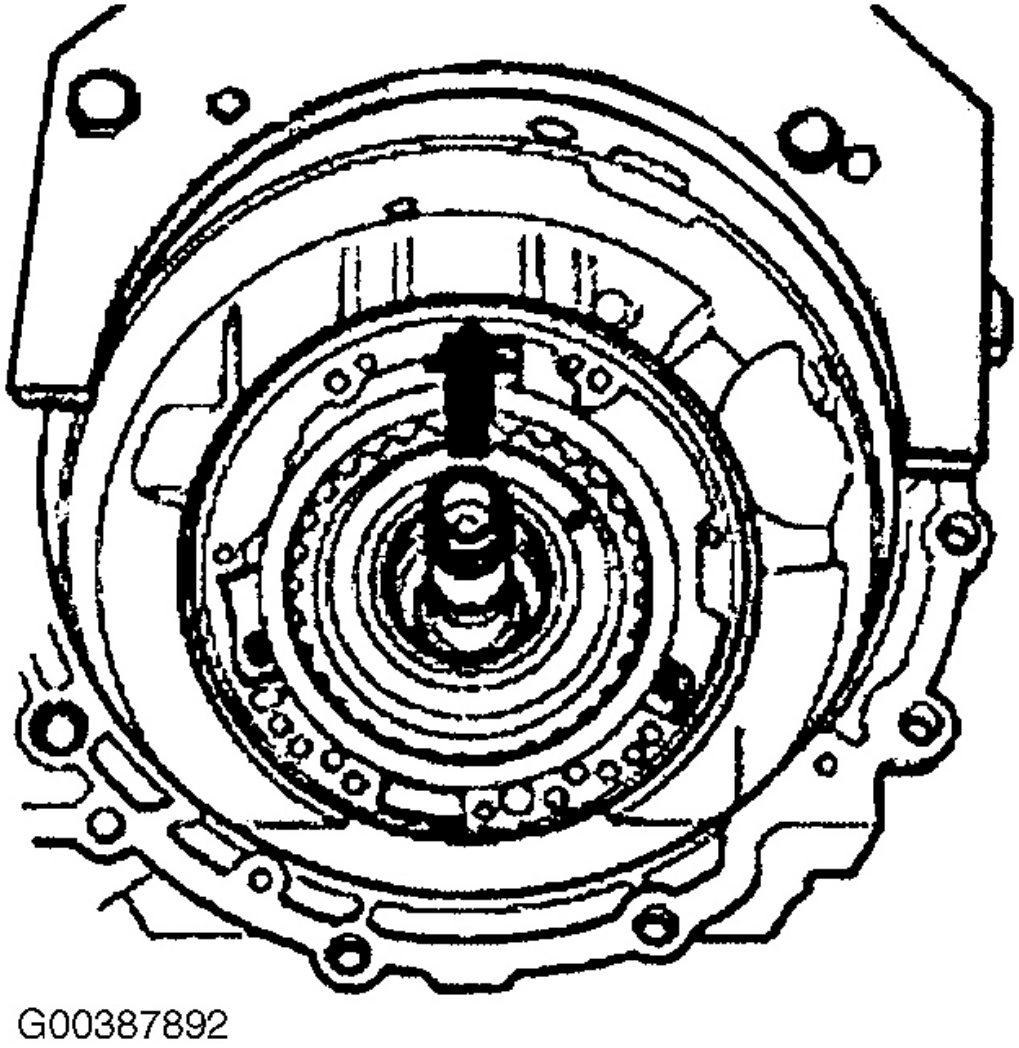


Fig. 58: Installing Sleeve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Screw threaded rod from assembly tool 3066 into differential threaded piece
B. Nut M12 with washer

- Pull sleeve in onto stop with thrust piece 3124 by turning on nut -B-.

NOTE: When transmission is disassembled press sleeve in with thrust piece 3124 onto stop.

Pulling out sleeve and oil seal

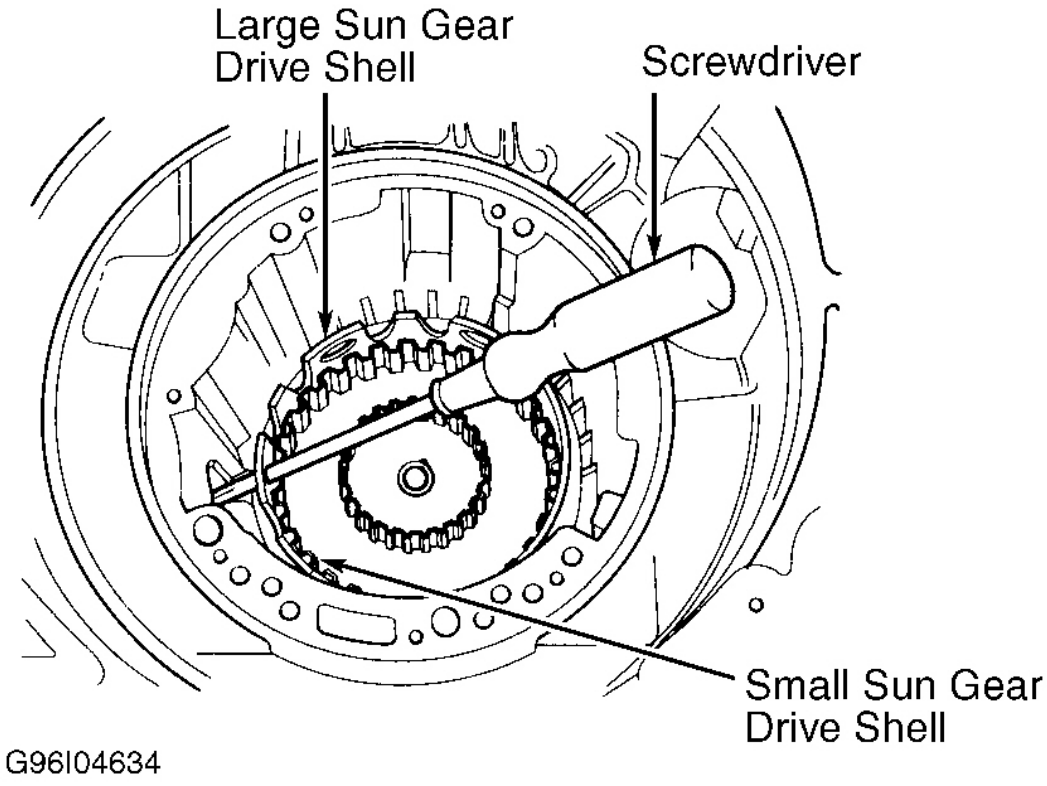
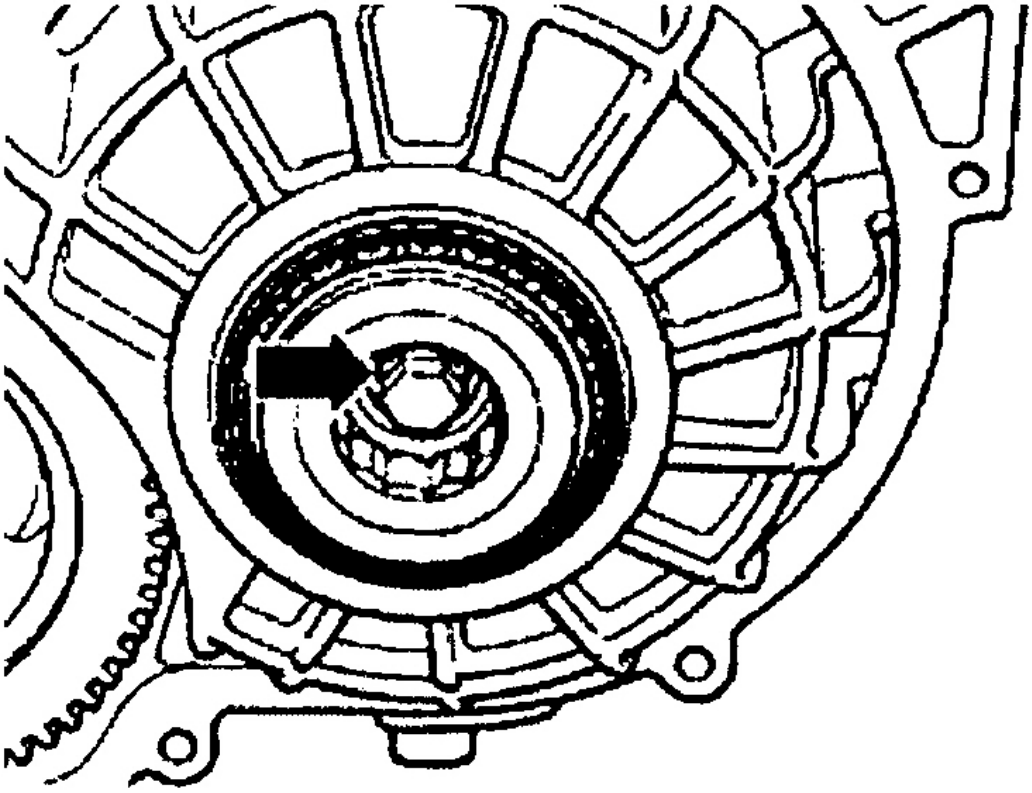


Fig. 59: Pulling Out Sleeve And Oil Seal
Courtesy of VOLKSWAGEN OF AMERICA, INC.

There is a step in inner diameter from sleeve

- For pulling out sleeve and oil seal, apply the pulling hook VW 771/37 at the back of the step in the sleeve.
- While pulling out press forcibly the pulling hook VW 771/37 into the sleeve.

Driving in sleeve and oil seal



G00387893

Fig. 60: Driving In Sleeve And Oil Seal
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Clean the sitting place of oil seal in transmission.

A. Screw threaded rod from assembly tool 3066 into differential threaded piece
B. Nut M12

- Drive sleeve over press piece T10148 onto stop by turning on nut -B-.

NOTE: When transmission is disassembled press sleeve in with press piece T10148 onto stop.

SELECTOR MECHANISM ON TRANSMISSION SIDE, UP TO 05.99, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 439 Guide pin
- VW 402 Press plate
- VW 408 A Press tool
- VW 447 H Press plate
- 3129 Fitting tool

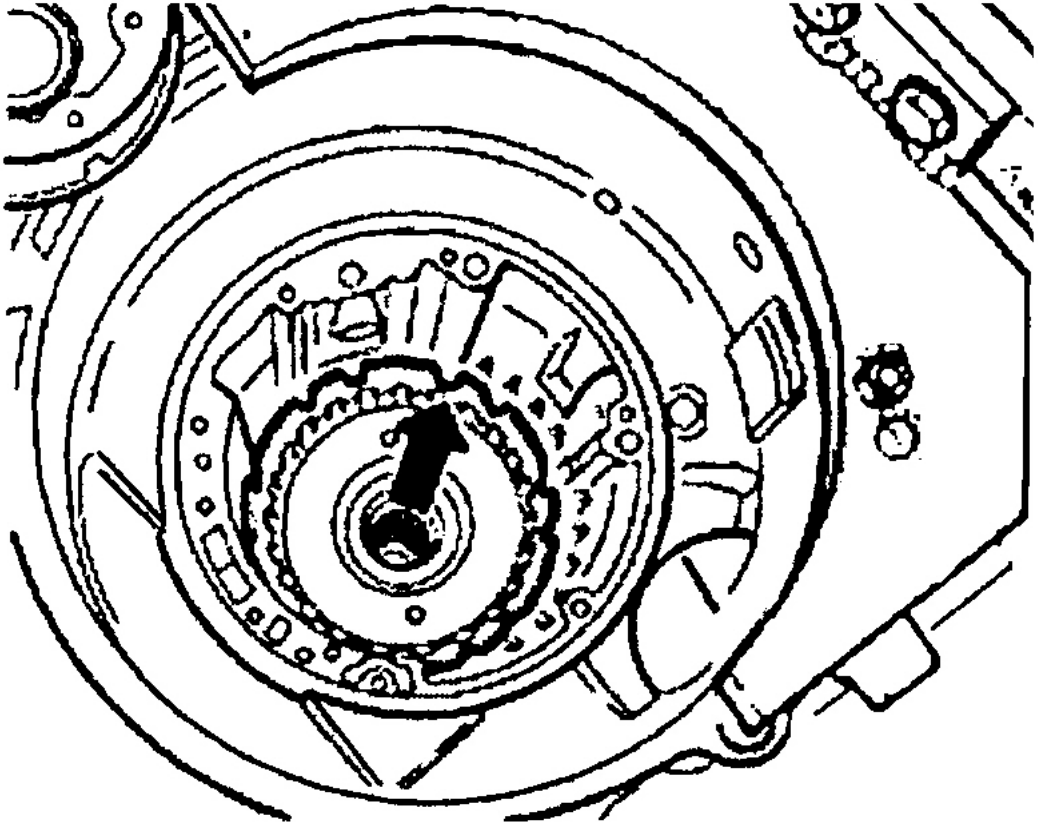


Fig. 61: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The following list refers to items in Fig. 62 .

1. **Selector shaft**
2. **Stop ring**

3. **Ball sleeve**
    - Removing. See **Removing ball sleeve from selector mechanism cover**
    - Pressing in. See **Driving ball sleeve into selector mechanism cover**
4. **Oil seal**
    - Pry out with screwdriver
    - Installing. See **Installing oil seal onto stop**
5. **Selector mechanism cover**
6. **Sleeve**
    - The lug points to reverse light switch
    - Lightly coat lug with MoS_2 grease
7. **Hex nut, 25 N.m**
    - Self-locking
    - Always replace
8. **Housing**
    - For back-up light switch
9. **Bolt**
10. **Cap**
    - For transmission breather
11. **Sleeve**
    - Drive in onto stop if present as an individual part
12. **Gear selector lever**
    - Install so that master spline aligns with selector shaft
    - Can be replaced with selector mechanism installed
    - Installation position. See **GEAR LEVER**
13. **Relay lever**
    - Installation position. See **GEAR LEVER**
14. **Nut, 15 N.m**
15. **Actuating arm**
    - With axis pin for mounting relay lever
    - Installation position. See **SELECTOR MECHANISM**
16. **Bolt**
    - Press into actuating arm
17. **O-ring**
    - Pull onto actuating arm axis pin
18. **Spacer**
    - Press into relay lever
19. **Locking bolt, 40 N.m**

20. **End cover**

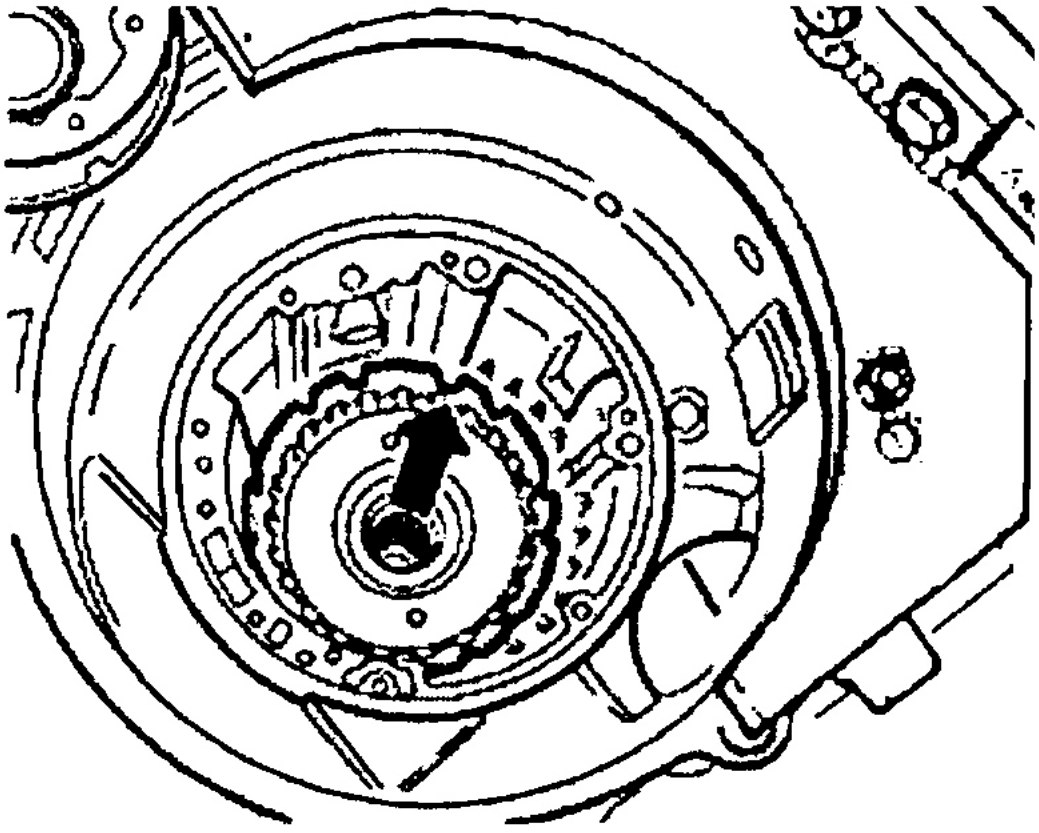


Fig. 62: Exploded View Of Selector Shaft Assembly (Up To 05.99)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing ball sleeve from selector mechanism cover

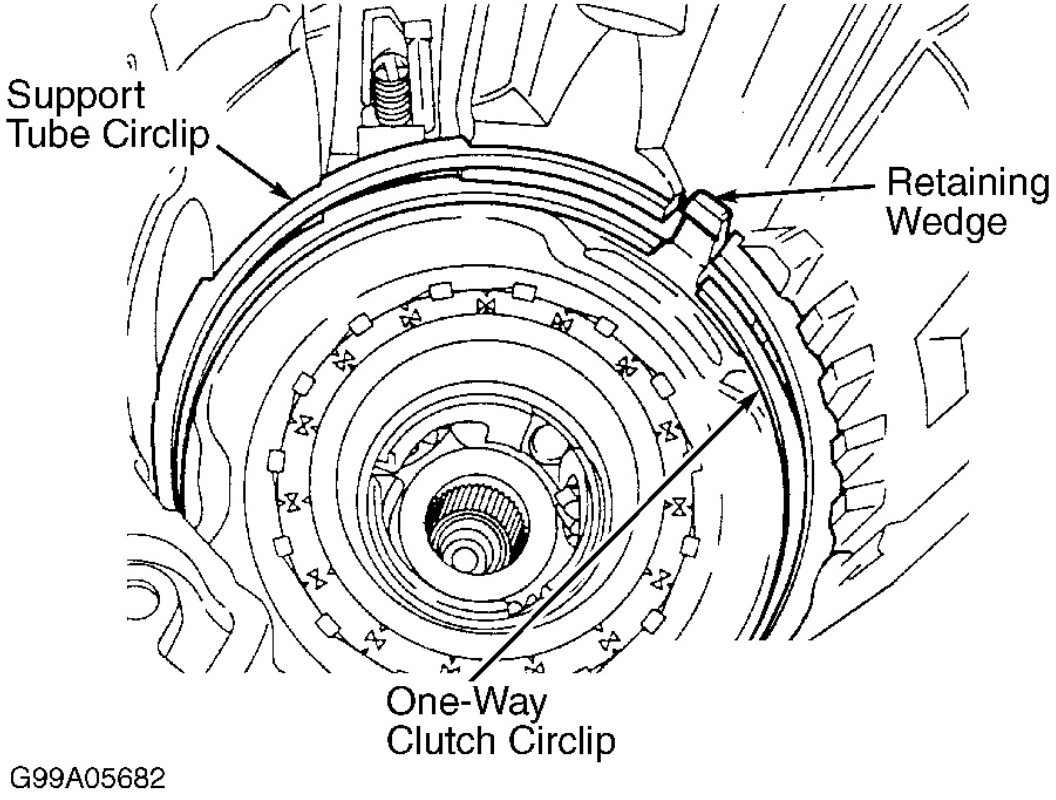
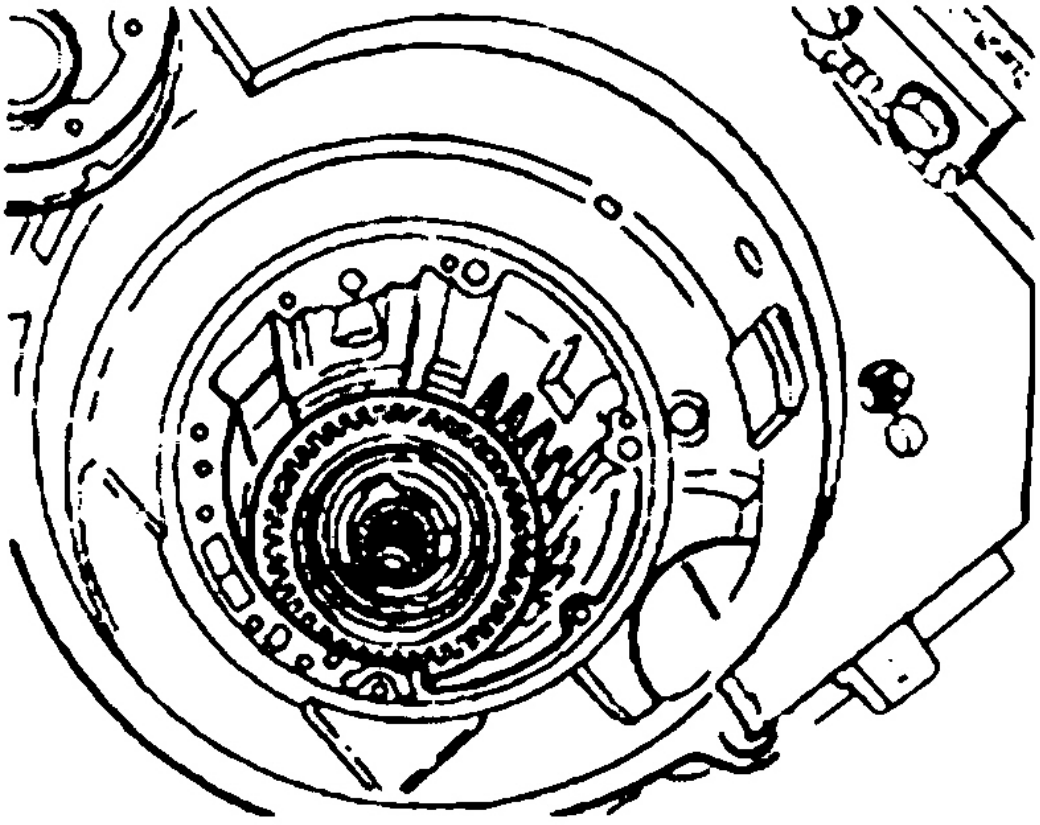


Fig. 63: Removing Ball Sleeve From Selector Mechanism Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Before pulling out ball sleeve, destroy plastic cage and remove balls.

A. Internal extractor, e.g. Kukko 21/3, 18.5... 23.5 mm

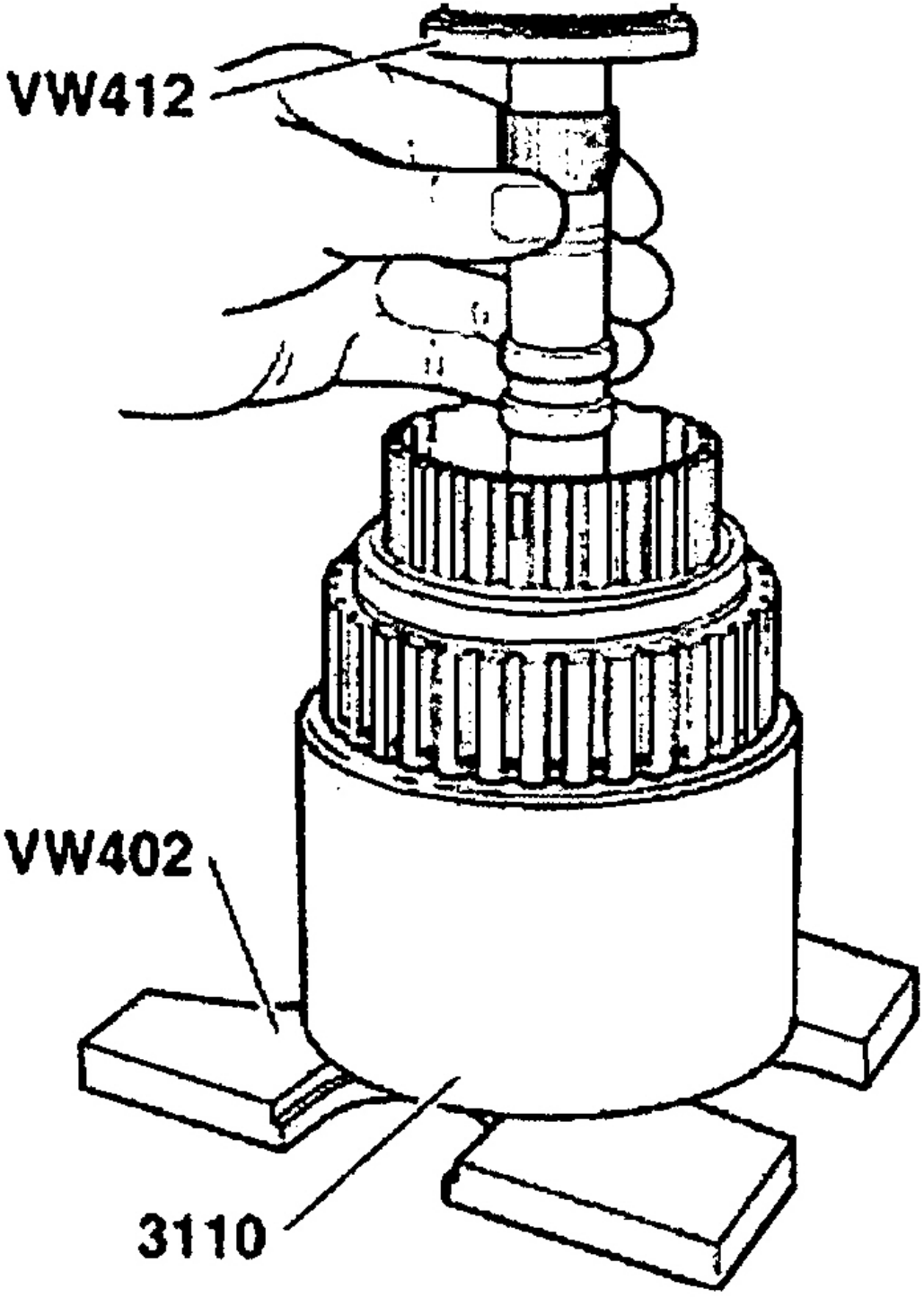
Driving ball sleeve into selector mechanism cover



G00387896

Fig. 64: Driving Ball Sleeve Into Selector Mechanism Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Installing oil seal onto stop



G00387891

Fig. 65: Installing Oil Seal Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

SELECTOR MECHANISM ON TRANSMISSION SIDE, AS OF 06.99, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 401 Press plate
- VW 408 A Press tool
- VW 423 Tube
- VW 439 Guide pin
- VW 447 i Thrust plate
- 1 -Kukko21/3 Internal puller

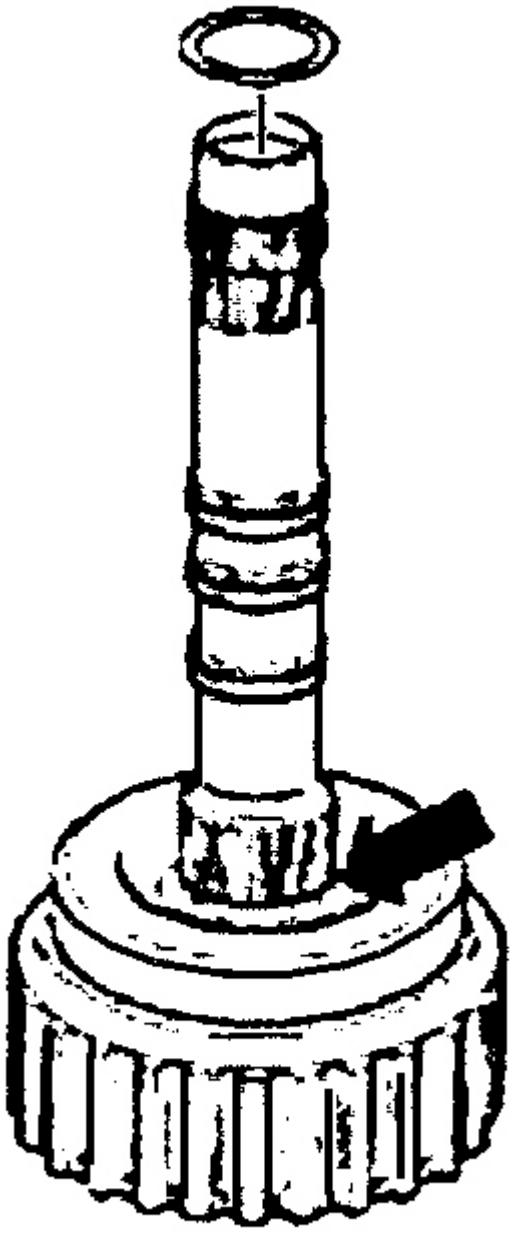


Fig. 66: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The following list refers to items in Fig. 67 .

1. **Selector shaft**
   - As of date of manufacture September 4th 2000 the locating sleeve has been changed in order to guide the switching gear into the 4th gear gap when shifting down from 5th to 4th gear. See **Selector mechanism cover and selector shaft changed**
2. **Stop ring**
3. **Ball sleeve**
   - Removing. See **Removing ball sleeve from selector mechanism cover**
   - Pressing in. See **Pressing ball sleeve into selector mechanism cover**
4. **Selector mechanism cover**
   - As of date of manufacture of September 4th 2000, with additional bolt in order to guide the switching gear into the 4th gear gap when shifting down from 5th to 4th gear. See **Selector mechanism cover and selector shaft changed**
5. **Reversing light switch, 20 N.m**
   - Lightly coat lug with MoS_2 grease
6. **Cap**
   - For transmission breather
7. **Relay lever**
   - Installation position. See **GEAR LEVER**
8. **Bushing**
9. **Oil seal**
   - Pry out with screwdriver
   - Installing. See **Installing oil seal onto stop**
10. **Circlip**
11. **Hex nut, 25 N.m**
    - Self-locking
    - Always replace
12. **Gear selector lever**
    - Install so that master spline aligns with selector shaft
    - Can be replaced with selector mechanism installed
    - Installation position. See **GEAR LEVER**
13. **End cover**

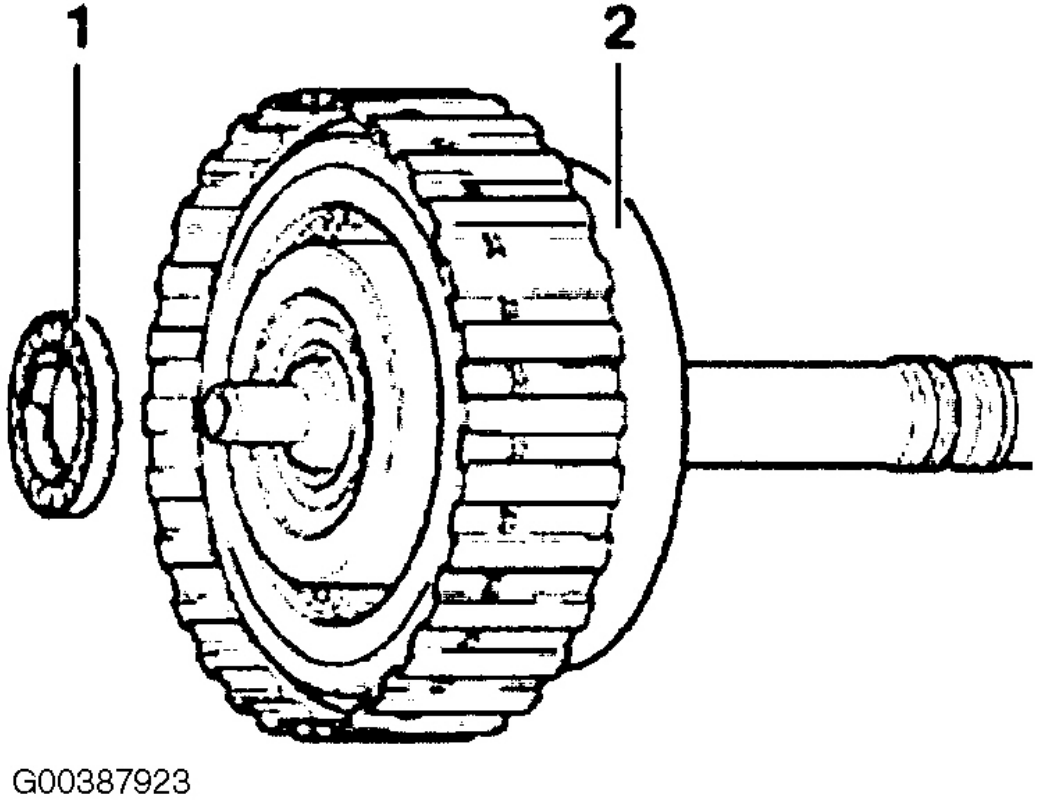


Fig. 67: Exploded View Of Selector Shaft Assembly (As Of 06.99)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing ball sleeve from selector mechanism cover

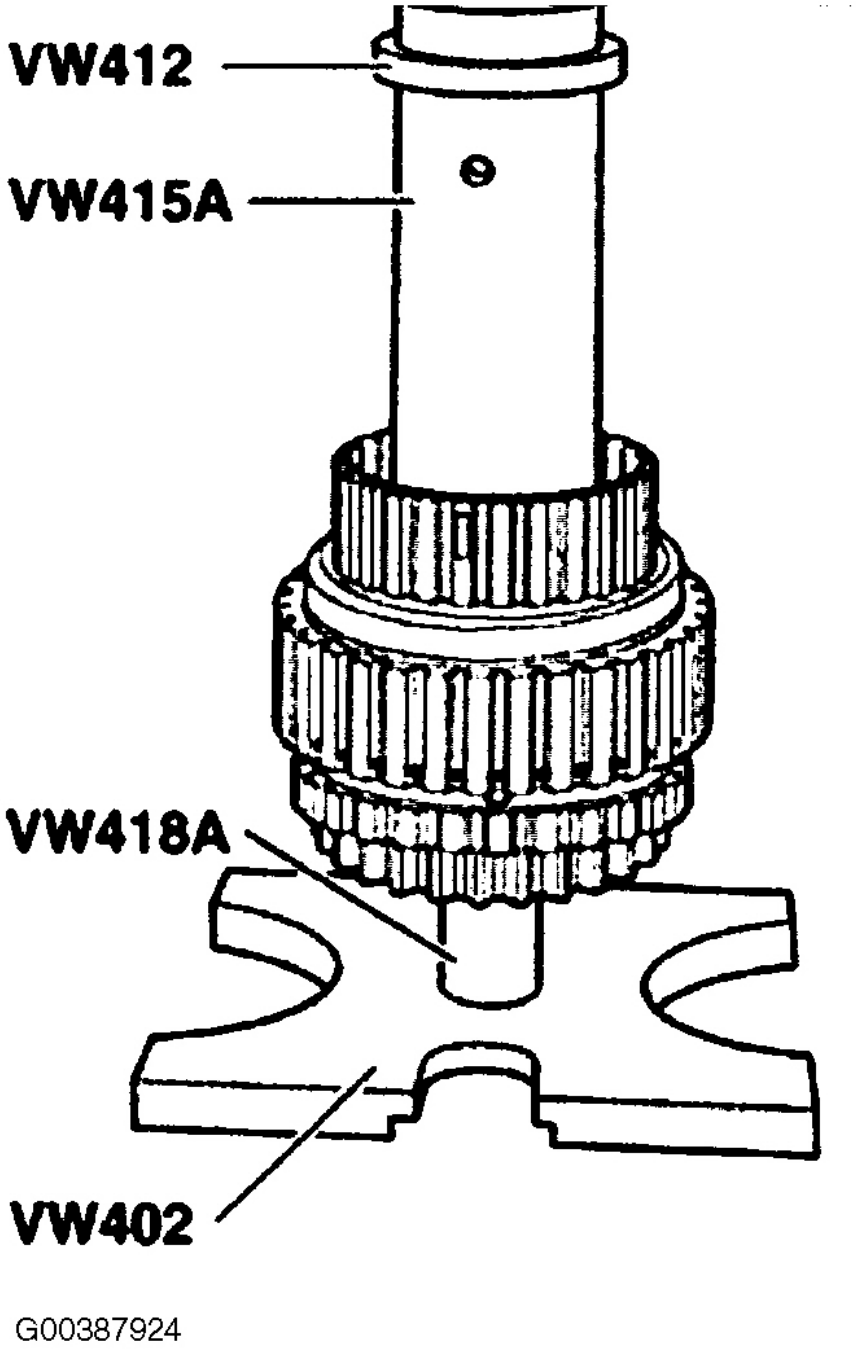


Fig. 68: Removing Ball Sleeve From Selector Mechanism Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Before pulling out ball sleeve, destroy plastic cage and remove balls.

A. Internal extractor, e.g. Kukko 21/3, 18.5... 23.5 mm

Pressing ball sleeve into selector mechanism cover

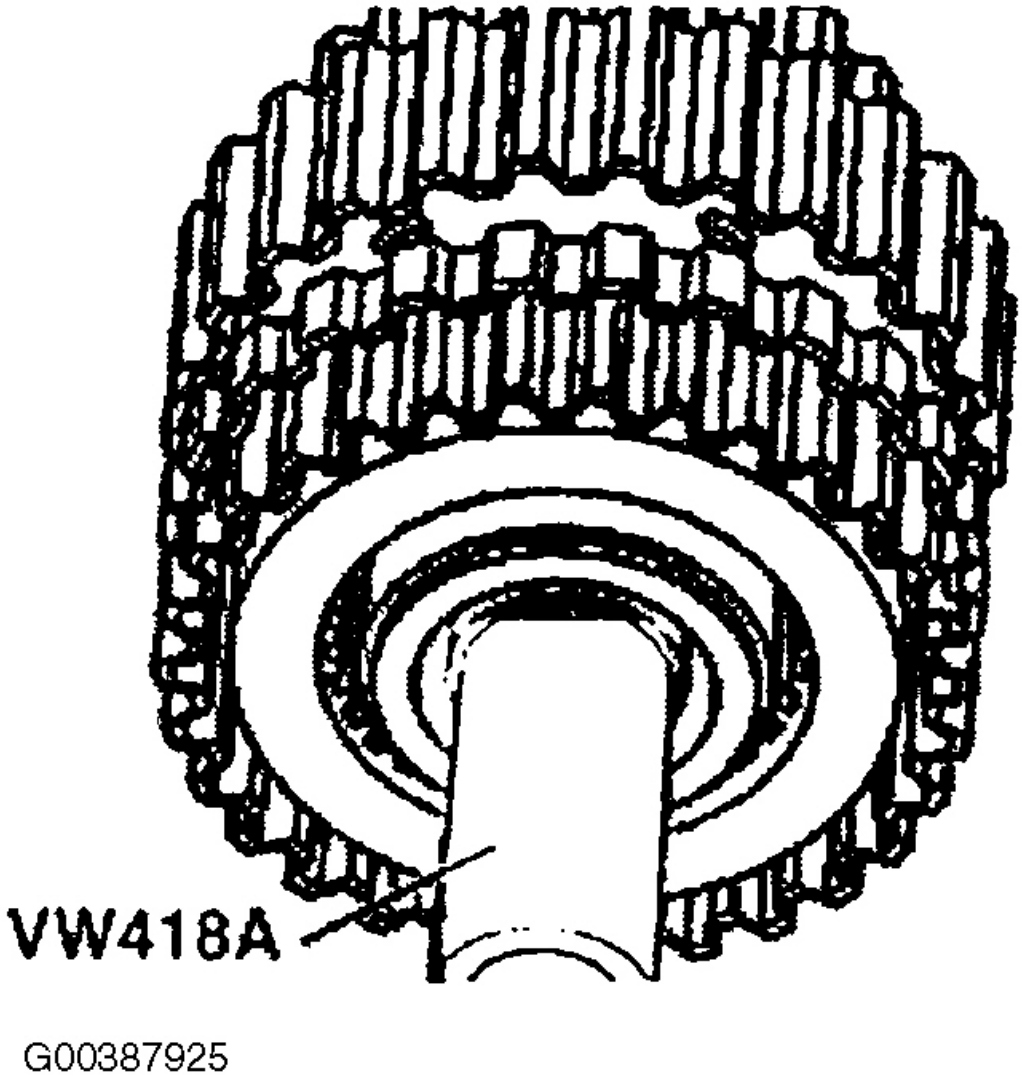
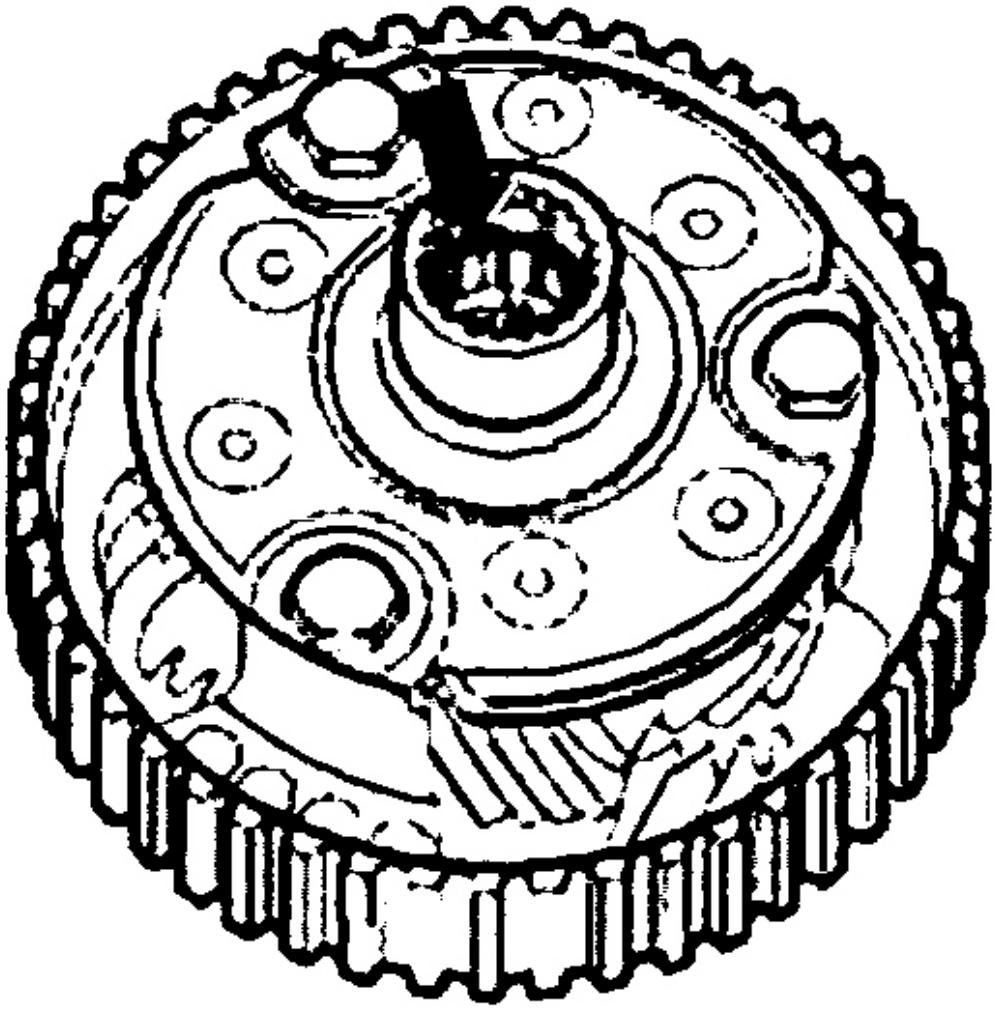


Fig. 69: Pressing Ball Sleeve Into Selector Mechanism Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

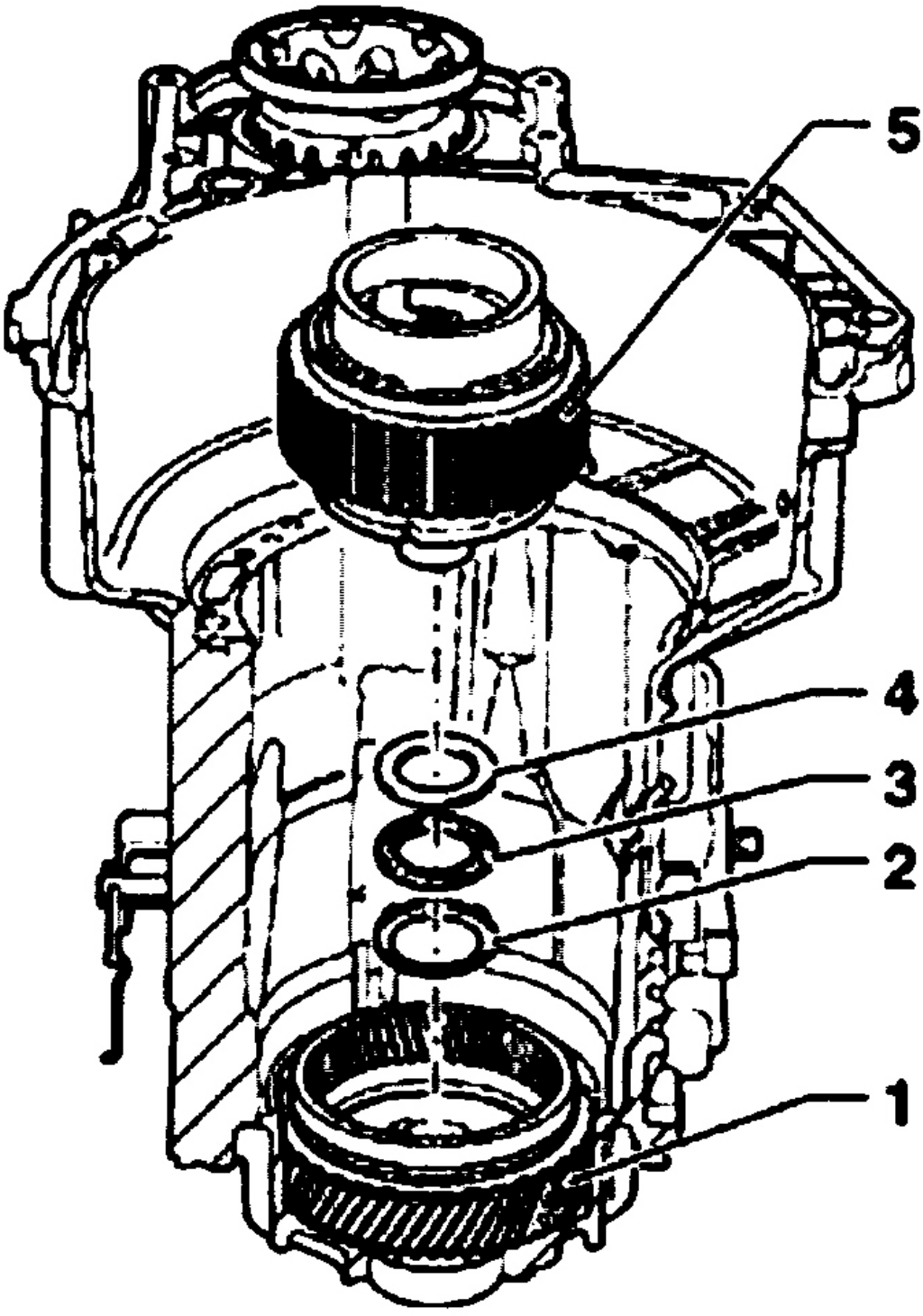
Installing oil seal onto stop



G00387926

Fig. 70: Installing Oil Seal Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Selector mechanism cover and selector shaft changed



G00387927

Fig. 71: Installing Selector Mechanism Cover And Selector Shaft Changed
Courtesy of VOLKSWAGEN OF AMERICA, INC.

As of date of manufacture of September 4th 2000 the bolt -2- is installed into the selector mechanism cover -1-.

Tightening torque

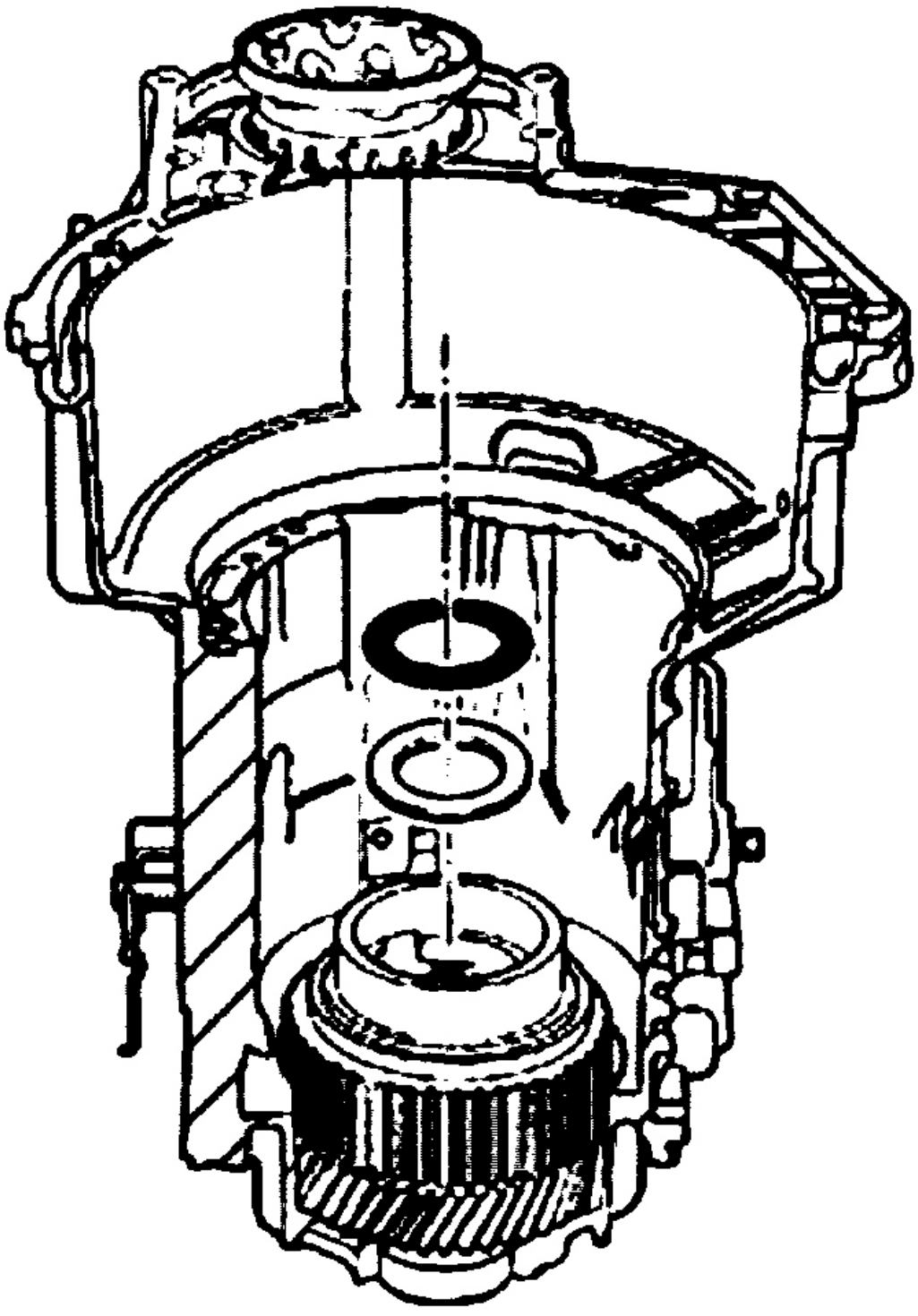
15 N.m

The selector shaft locating sleeve has been equipped with the segment -3-.

Function

When shifting down from the 5th to 4th gear the bolt -2- guides the selector shaft via the segment -3- into the 4th gear gap.

Selector mechanism cover and selector shaft changed



G00387928

Fig. 72: Changing Selector Mechanism Cover And Selector Shaft
Courtesy of VOLKSWAGEN OF AMERICA, INC.

As of date of manufacture of August 6th 2001 the selector shaft is manufactured with the recesses -A-.

The spring -B- is fitted in the selector mechanism cover.

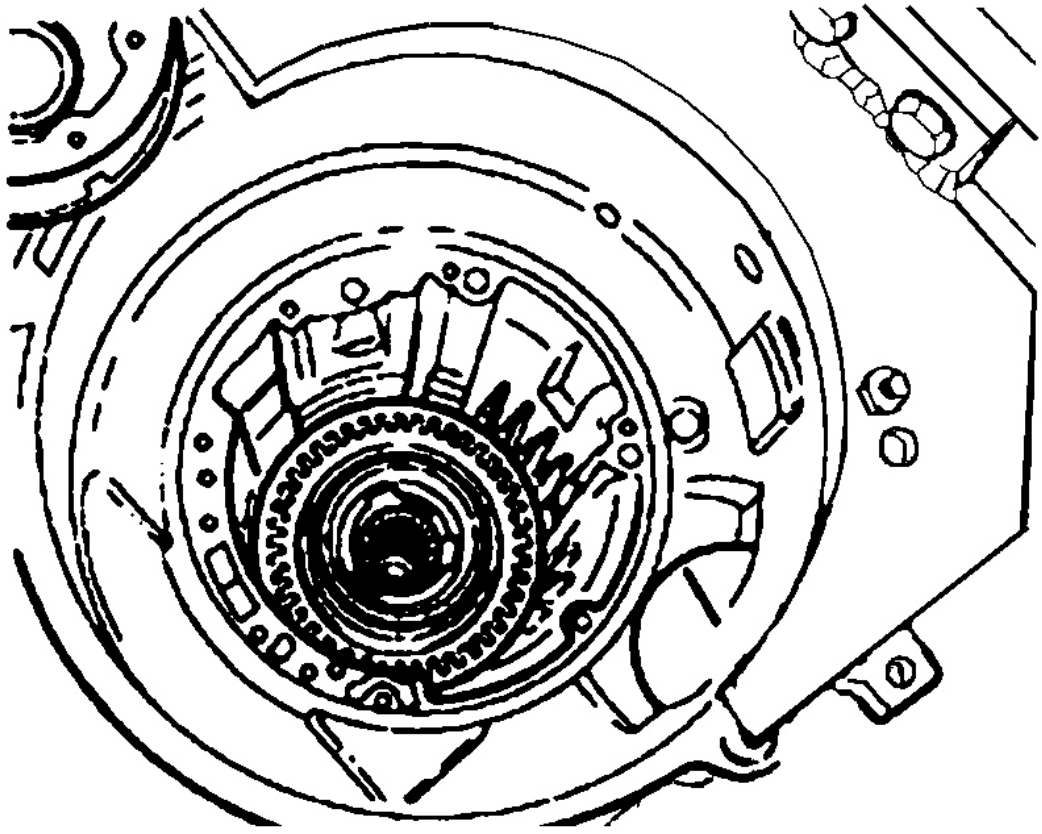
Function

With one selected forward gear, the selector shaft is secured via one of the recesses -A- with the spring -B- in the selector mechanism cover.

SELECTOR FORKS, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 402 Press plate
- 3290/1 Press piece from mounting device 3290
- 3301 Mounting device
- VW 431 Press piece
- VW 472/2 Spacer sleeve
- 10-206 Drift



G00387929

Fig. 73: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 80-200 Removal lever
- 10-508 Assembly mandrel
- 2070 Tensioning device

NOTE: The selector fork group (item 7) does not need disassembling and assembling the selector segments to disassemble the bearings and the circlips.

NOTE: The following list refers to items in Fig. 74 .

1. **Selector segment 5th gear**
   - Identification. See **Identifying Selector Segments**
   - After installing circlip selector segment must rotate freely

2. **Circlip**
    - Always replace
    - Removing. See **Installing circlip**
    - Installing. See **Installing circlip**
3. **5th gear selector fork**
    - Adjusting. See **ADJUSTING 5TH GEAR:**
4. **Bolt, 25 N.m**
5. **5th gear selector jaw**
6. **Bearing**
    - 4 Pieces
    - Removing. See **Removing bearing inner race**
    - Pressing inner ring into outer ring. See **Pressing Bearing Inner Ring Into Outer Ring**
    - Pressing in. See **Pressing Inner Race In Selector Fork Onto Stop**
7. **Selector fork group with selector rails**
8. **Selector segment 1st/2nd gear**
    - Identification. See **Identifying Selector Segments**
    - After installing the circlip the segment must rotate freely
9. **Selector segment 3rd/4th gear**
    - Identification. See **Identifying Selector Segments**
    - After installing the circlip the segment must rotate freely
10. **Domed sliding piece**
11. **Spring**
12. **Reverse gear selector fork**
13. **Support for reverse gear selector fork**
14. **Circlip**

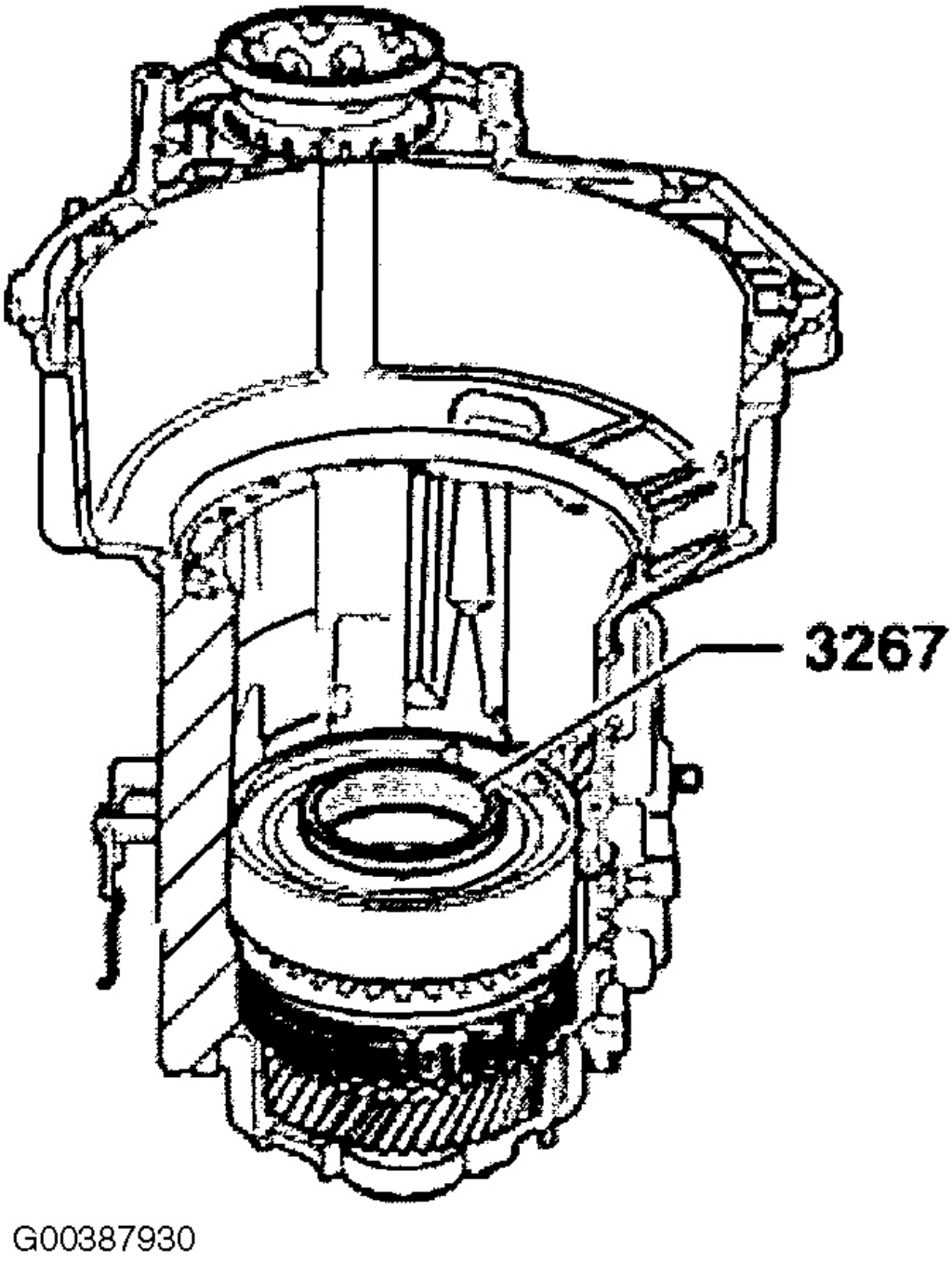


Fig. 74: Disassembling Selector Fork Assembly
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Identifying Selector Segments

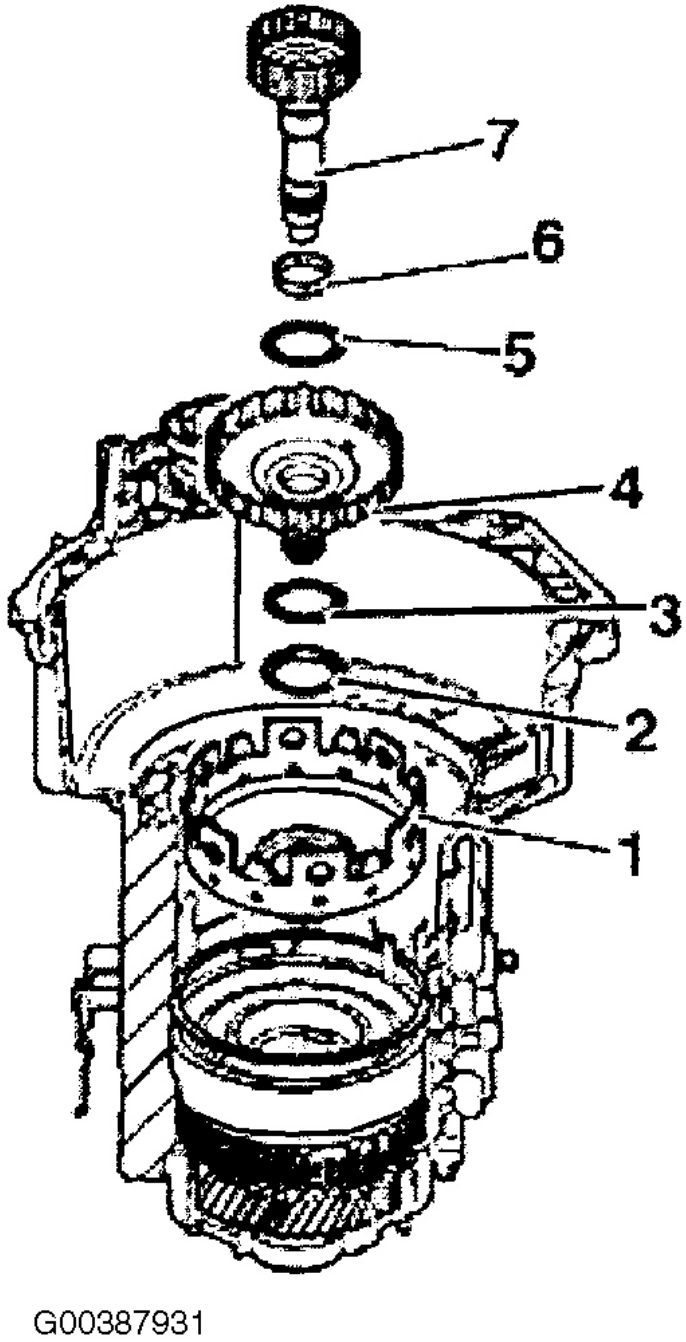


Fig. 75: Identifying Selector Segments
Courtesy of VOLKSWAGEN OF AMERICA, INC.

1. 1st and 2nd gear selector segments = 12.1 mm

   1st and 2nd gear selector segments with changed synchronization = 11.4 mm. See **Changed springs for 5th gear synchronizer from transmission manufacture date November 11 01**

   The shorter selector segments can be installed in previous transmissions.

2. 3rd and 4th gear selector segments = 7.7 mm
3. 5th gear selector segments = 12.1 mm

Removing circlip

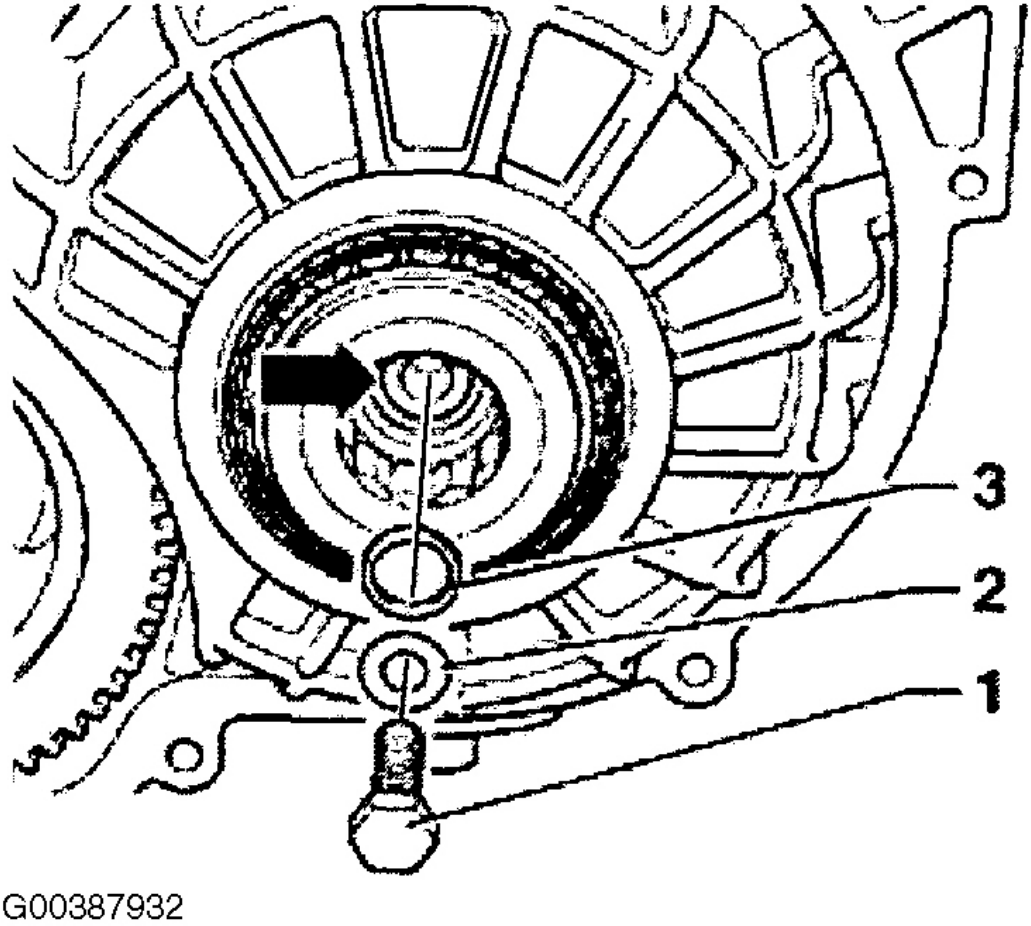


Fig. 76: Removing Circlip
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Tighten selector fork into screwed stick with the vice clamps -B-.
- Pry circlip in direction of arrow -A-.

Installing circlip

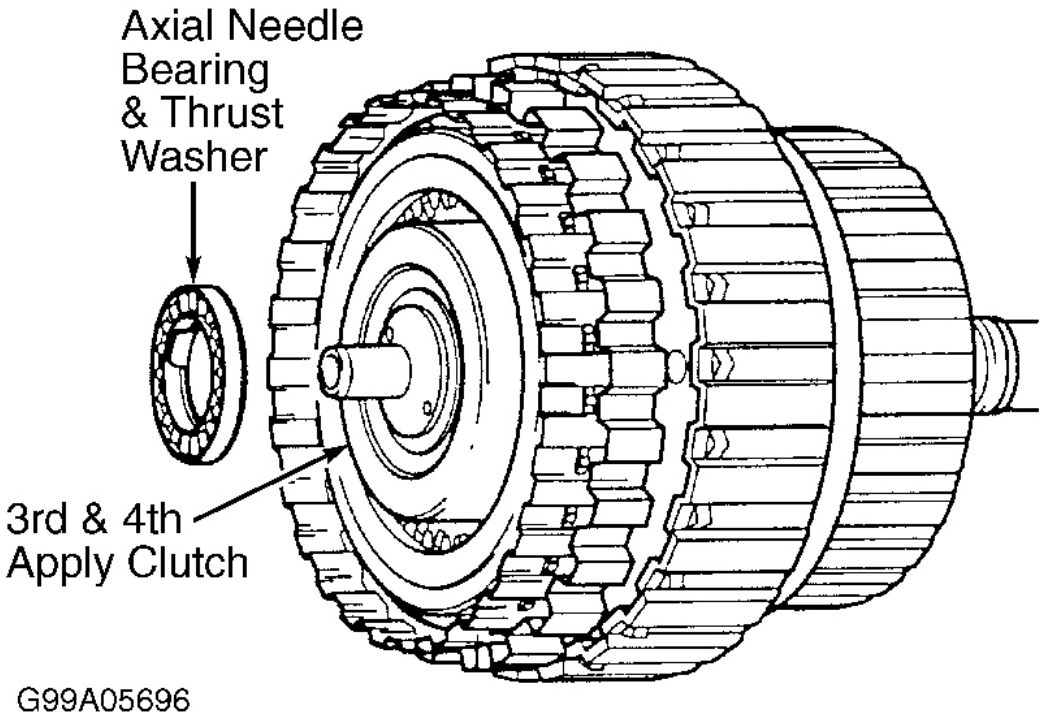


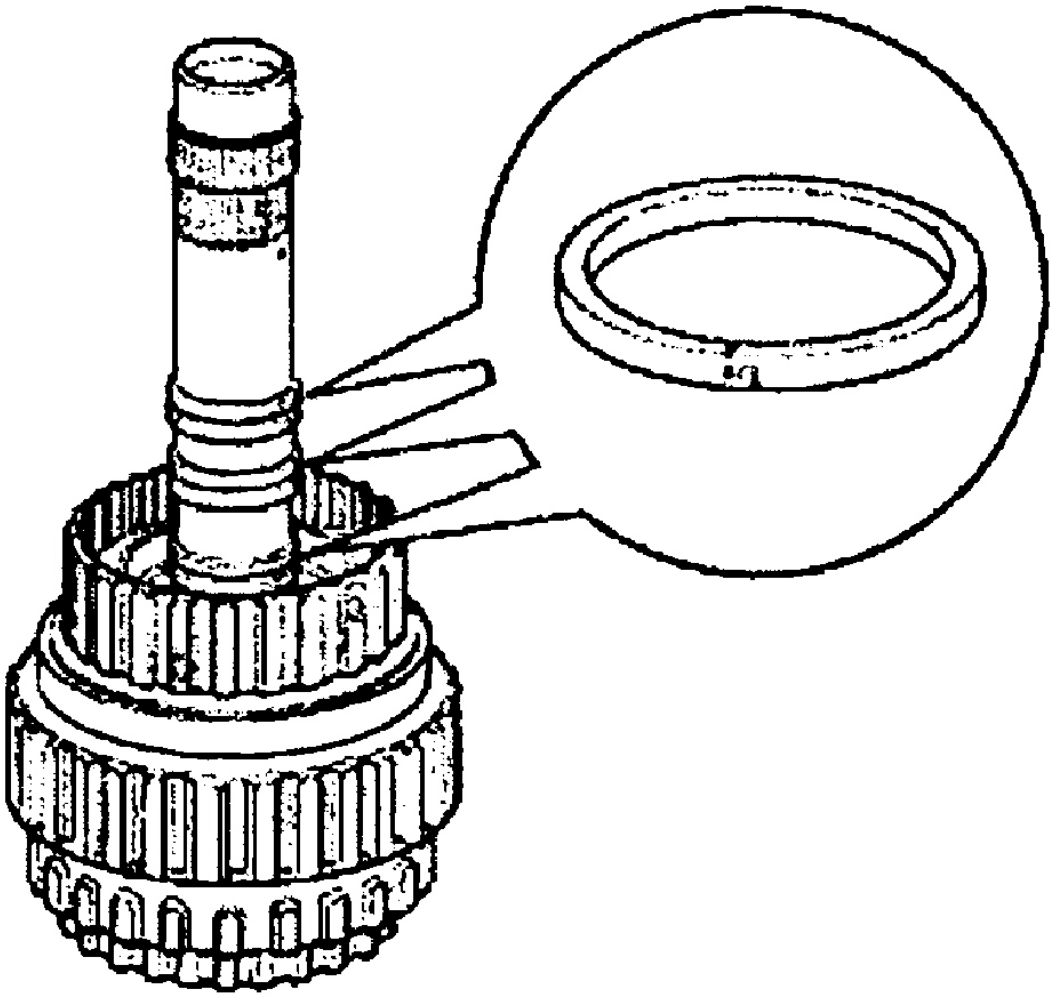
Fig. 77: Installing Circlip
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press circlip into selector segment groove with socket.

NOTE: After installing the circlip the selector segment must rotate freely.

A. Socket driver, 10 mm A/F
B. Vice clamps

Removing bearing inner race



G00387933

Fig. 78: Removing Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: When removing and installing the inner races do not bend selector forks.

Pressing Bearing Inner Ring Into Outer Ring

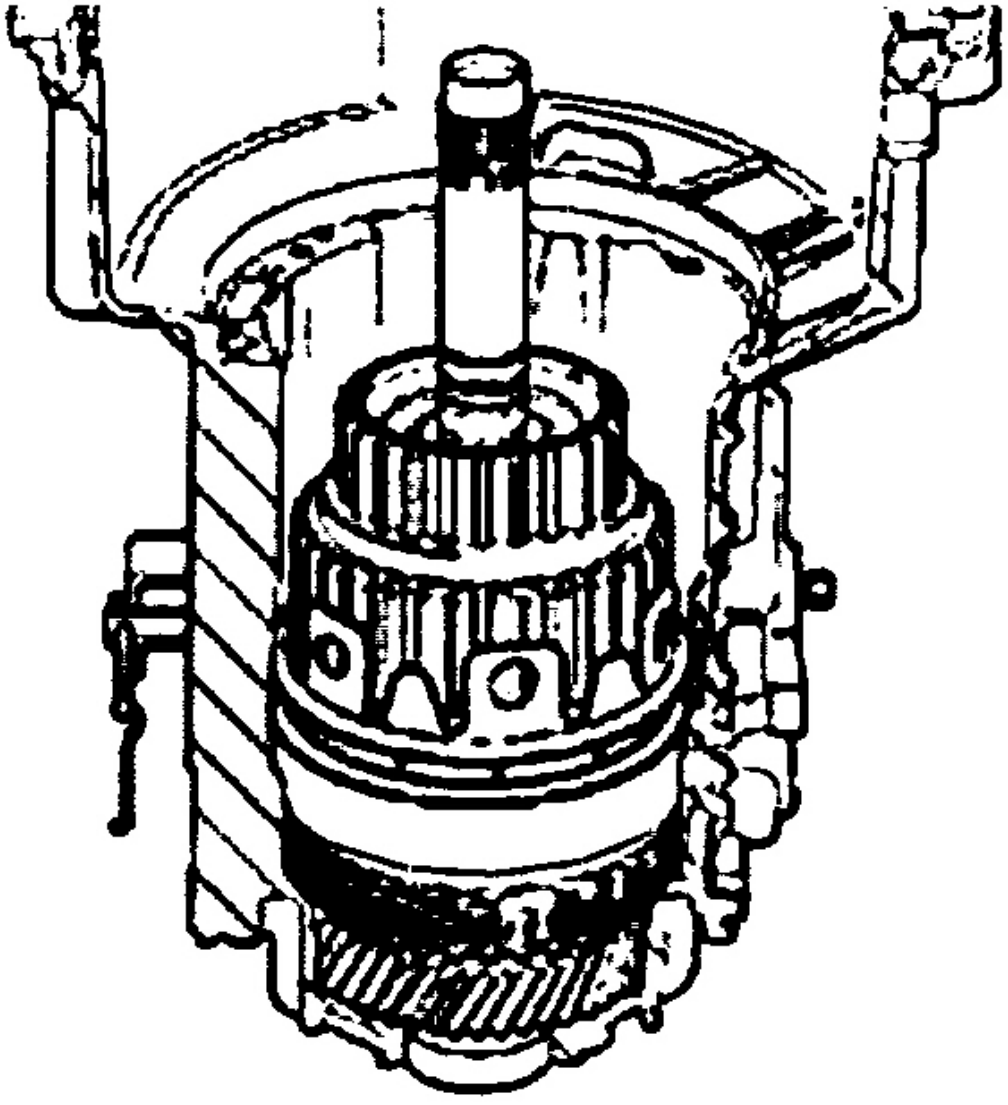


Fig. 79: Pressing Bearing Inner Ring Into Outer Ring
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The inner ring must secure with the outer ring.

Pressing Inner Race In Selector Fork Onto Stop

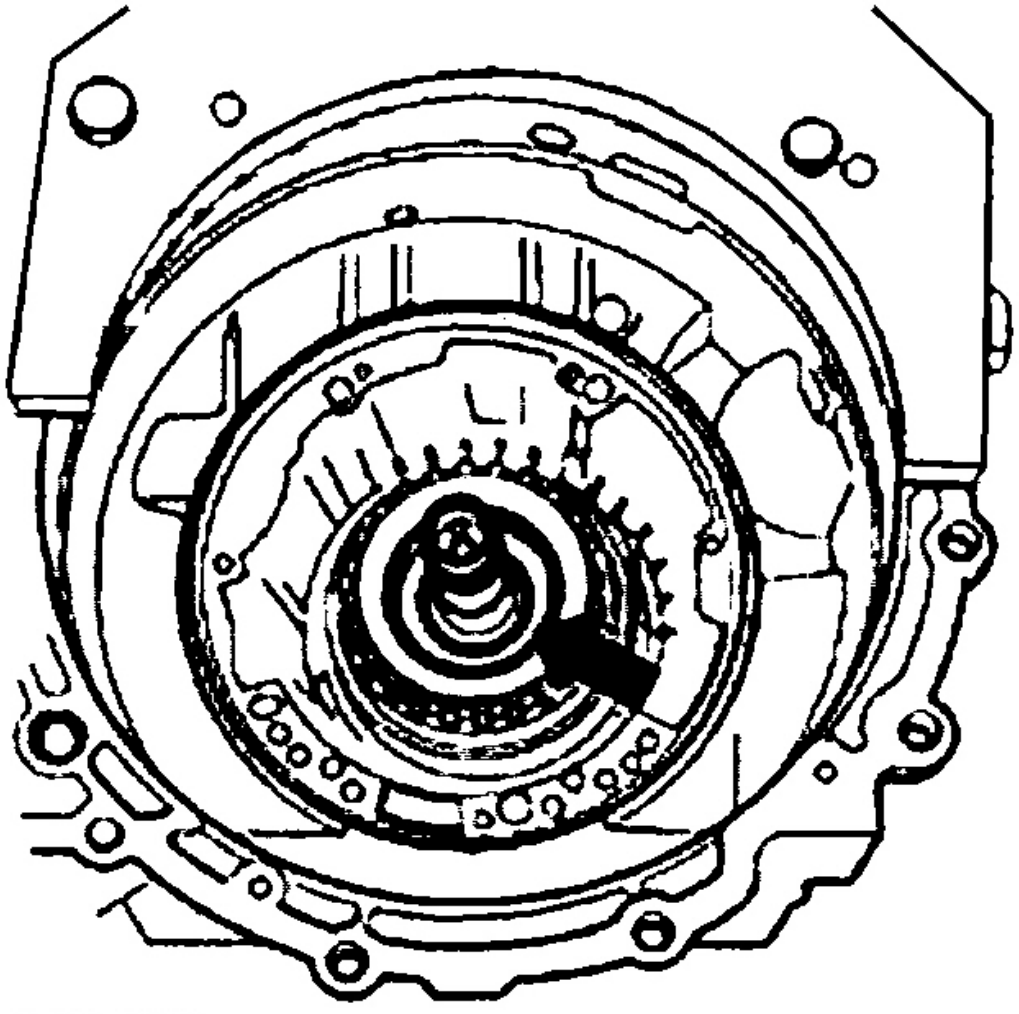


Fig. 80: Pressing Inner Race In Selector Fork Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The hollow in press piece 3290/1 points to bearing.

Selector Fork With Selector Segments Installed

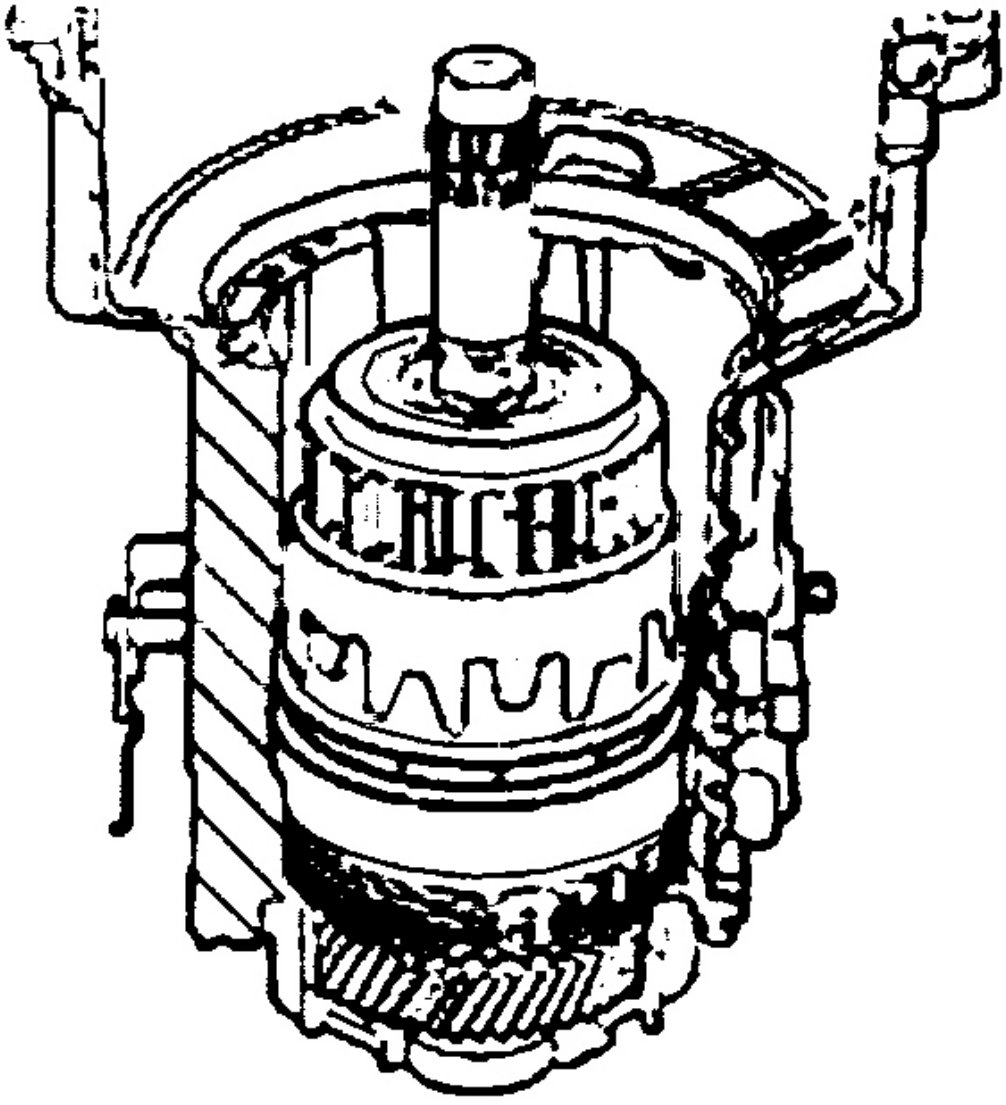


Fig. 81: Installing Selector Fork With Selector Segments
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Selector Fork Measurements

Application	(1) Dim. -a- (mm)
1st/2nd gear selector fork	87.2 ... 87.9

1st and 2nd gear selector segments with changed synchronization. See **Changed springs for 5th gear synchronizer from transmission manufacture date November 11 01**	88.4 ... 89.1
3rd/4th gear selector forks	96.0 ... 96.7
(1) For dimension a, see **Fig. 81** .	

Selector segment assignment. See **Identifying Selector Segments** .

MANUAL TRANSMISSION - GEARS, SHAFTS

INPUT SHAFT, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 407 H Press tool
- VW 447 H Press plate
- VW412 Press tool
- VW 422 Tube
- VW 401 Press plate
- VW 408 A Press tool

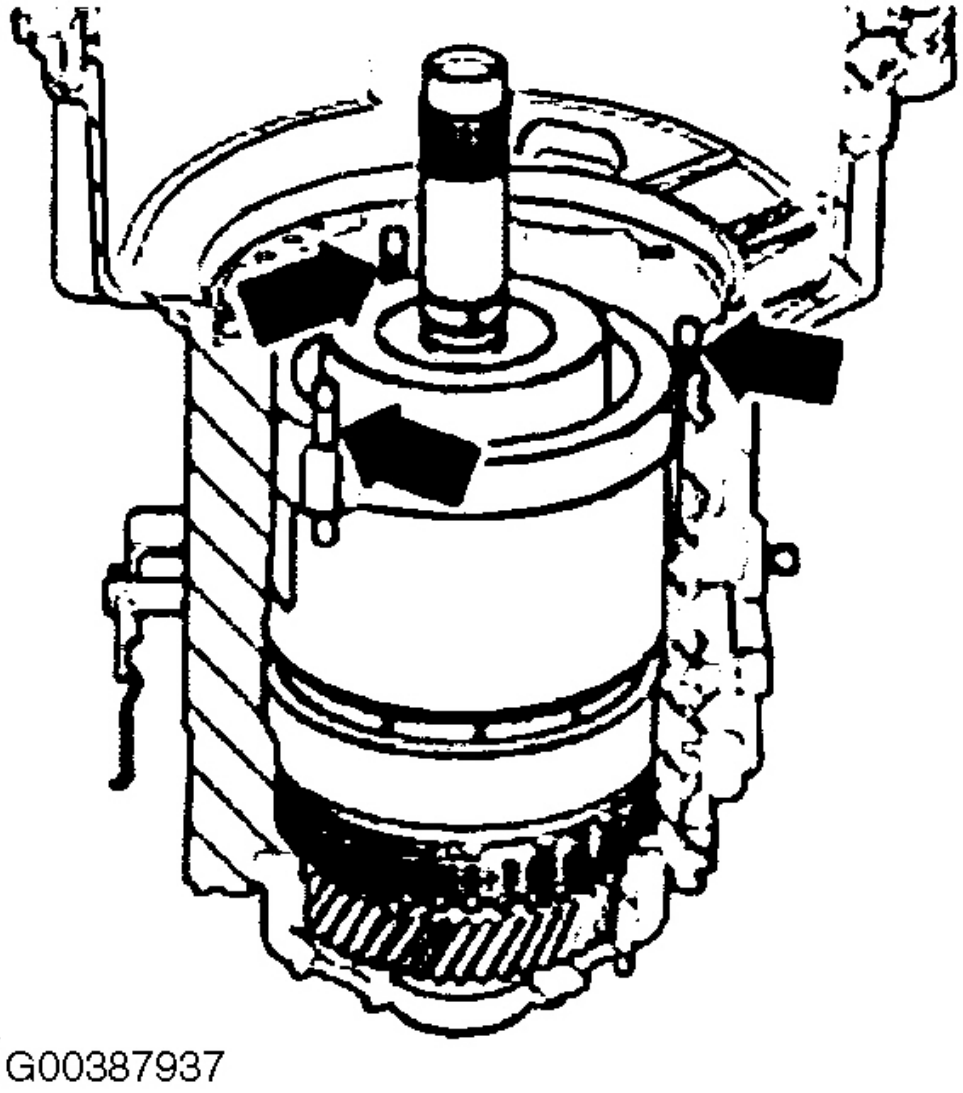


Fig. 82: Identifying Special Tools And Equipment (1 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VW 421 Tube
- VW 454 Press piece
- VW 447 i Thrust plate
- VW510 Press piece
- 41-501 Drift sleeve

- 3-Kukko 17/1 Separating device

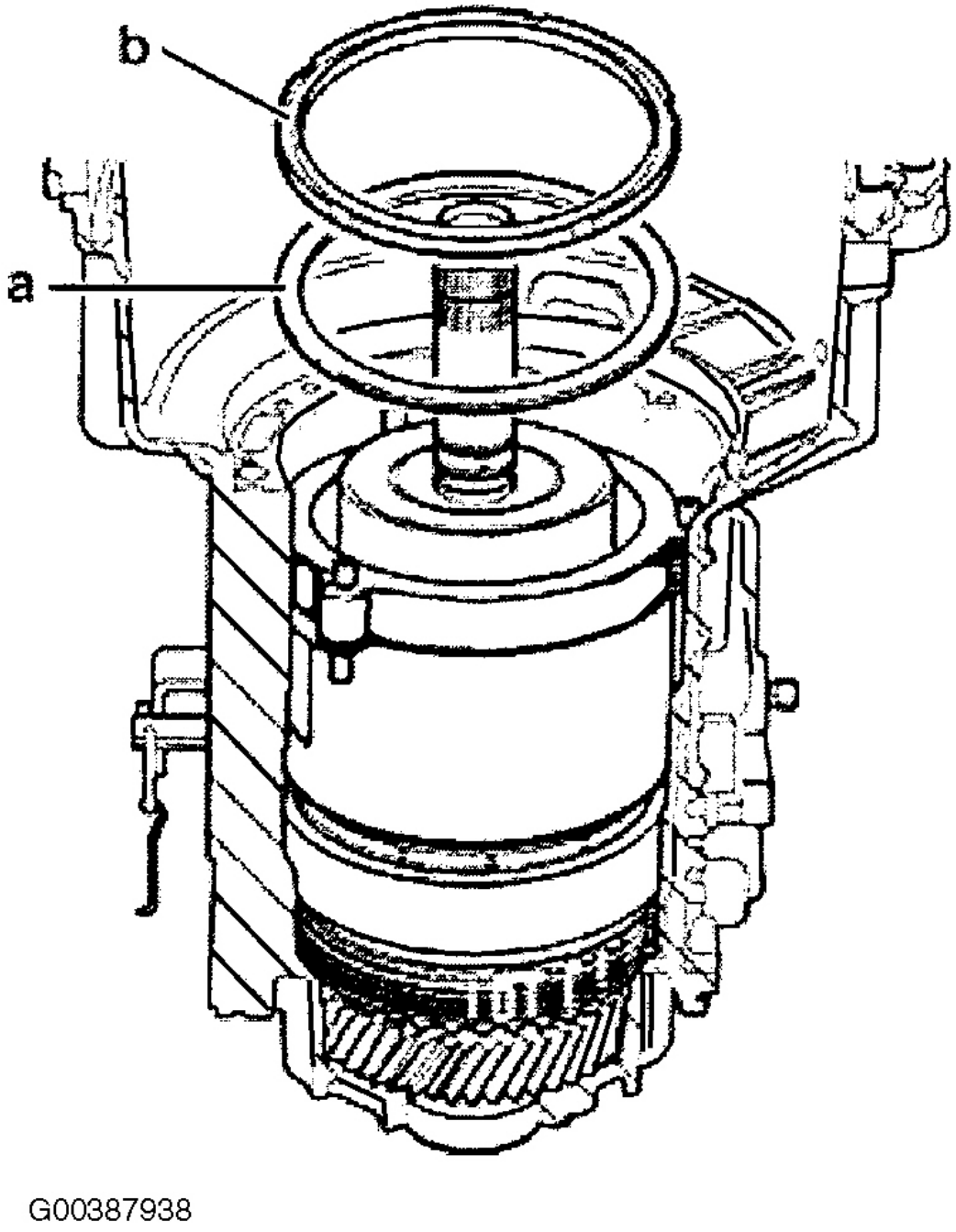


Fig. 83: Identifying Special Tools And Equipment (2 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE:

- **When installing new gear wheels, consult technical data. See Code letters, transmission application, ratios, capacities .**
- **If the position of the tapered roller bearings is affected when exchanging parts, the input shaft must be readjusted. See adjustment overview. See Adjustment overview .**

NOTE: The following list refers to items in Fig. 84 .

1. **Clutch housing**
2. **Tapered roller bearing outer race**
   - Removing. See **Pressing out tapered roller bearing outer race**
   - Pressing in. See **Pressing in tapered roller bearing outer race**
3. **Tapered roller bearing inner race**
   - Pressing off. See **Pressing off tapered roller bearing inner race** .
   - Pressing on **Pressing on tapered roller bearing inner race** .
4. **Input shaft**
   - Adjusting. See **INPUT SHAFT, ADJUSTING**
5. **3rd gear wheel**
   - Shoulder points to 4th gear
   - Pressing off. See **Pressing off 4th gear wheel with tapered roller bearing and sleeve**
   - Pressing on **Pressing on 3rd gear wheel**
6. **Circlip**
   - Always replace
7. **4th gear wheel**
   - Press off with tapered roller bearing inner race and sleeve. See **Pressing off 4th gear wheel with tapered roller bearing and sleeve**
   - Pressing on **Pressing on 4th gear wheel**
   - Collar faces to 3rd gear
8. **Tapered roller bearing inner race**
   - Pressing off with 4th gear wheel and sleeve. See **Pressing off 4th gear wheel with tapered roller bearing and sleeve**
   - Pressing on **Pressing on tapered roller bearing inner race**
9. **Thrust washer**
10. **Tapered roller bearing outer race**
    - Pressing out **Pressing out tapered roller bearing outer race**
    - Pressing in. See **Pressing in tapered roller bearing outer race**
11. **Shim**
    - Determining thickness adjusting input shaft. See **INPUT SHAFT, ADJUSTING**

12. **Transmission housing**
13. **Sleeve**
    - For needle roller bearing
    - Press off with 4th gear wheel and tapered roller bearing inner race. See **Pressing off 4th gear wheel with tapered roller bearing and sleeve**
    - Pressing on **Pressing on tapered roller bearing inner race**
    - Place thrust washer on before installing (item 9)
14. **Needle roller bearing**
15. **5th gear wheel**
    - Pull off together with 5th gear synchro-hub. See **Assembly sequence**
16. **5th gear synchro-ring**
    - With cast locking pieces. See **5th gear synchro-ring with cast locking pieces (arrows)**
    - Check for wear. See **Checking 5th gear synchro-ring**
17. **Spring**
    - Installation position. See **Assembling 5th gear locking collar/synchro-hub**
    - From transmission manufacture date November 05 01 the spring was changed. See **CHANGED SPRINGS FOR 5TH GEAR SYNCHRONIZER FROM TRANSMISSION MANUFACTURE DATE NOVEMBER 11 01**
18. **Lock pieces (Qty. 3)**
    - Installation position. See **5th gear synchronizer**
    - From transmission manufacture date March 05 01 are lock pieces installed, which are inner hollow
19. **5th gear synchro-hub**
    - Removing and installing. See **Assembly sequence**
20. **5th gear locking collar**
    - Removing and installing. See **Assembly sequence**
21. **Dished washer**
    - Installation position. See **Installation position of dished spring for gear wheel and 5th gear synchro-hub securing bolts:**
22. **Torx socket head bolt M 10, 80 N.m**
    - Installed piece on bolt head locates dished spring. See **Installation position of dished spring for gear wheel and 5th gear synchro-hub securing bolts:**

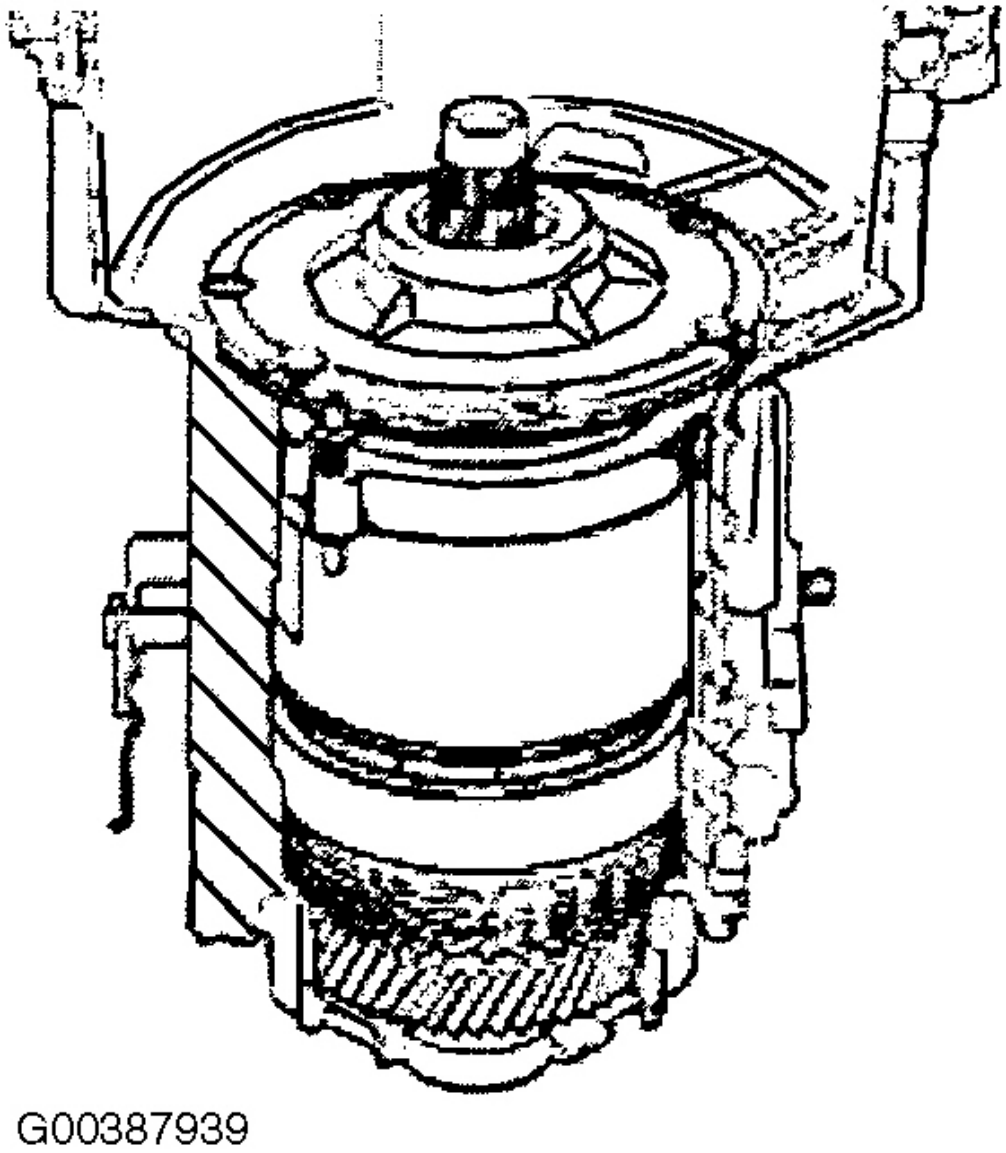
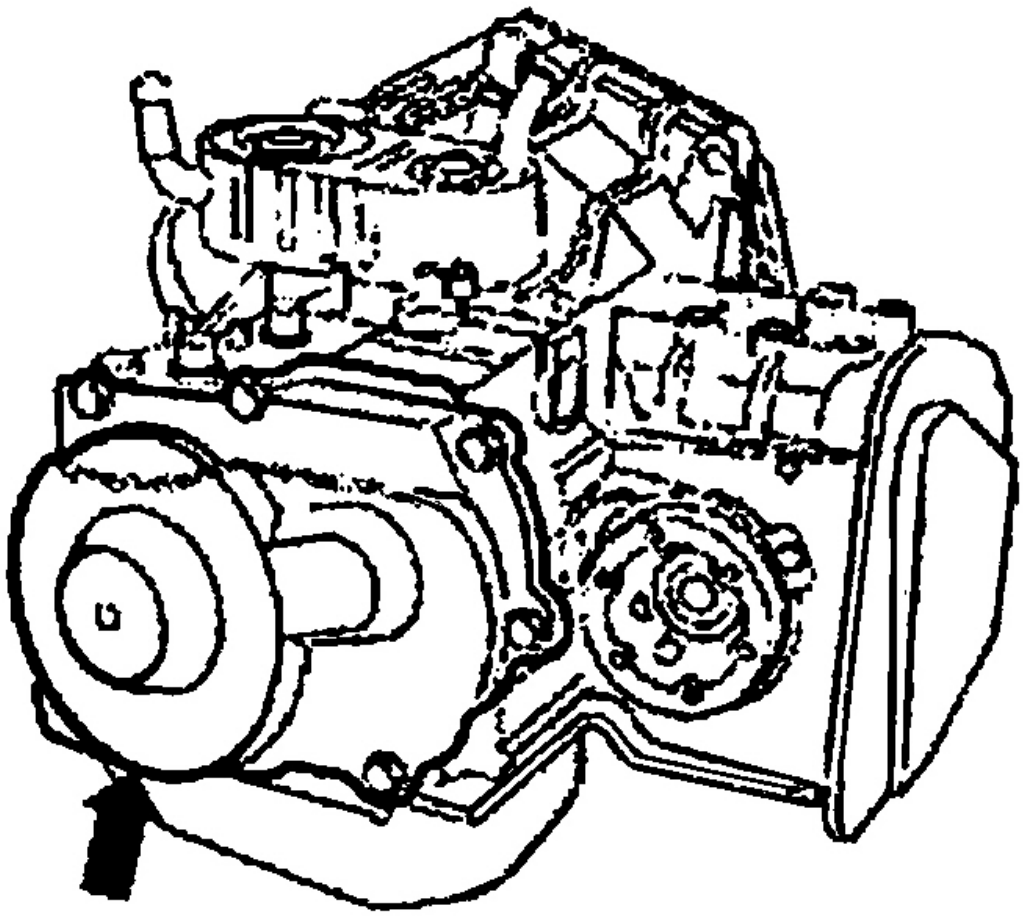


Fig. 84: Disassembling Input Shaft Assembly
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing out tapered roller bearing outer race



G00387940

Fig. 85: Pressing Out Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing in tapered roller bearing outer race

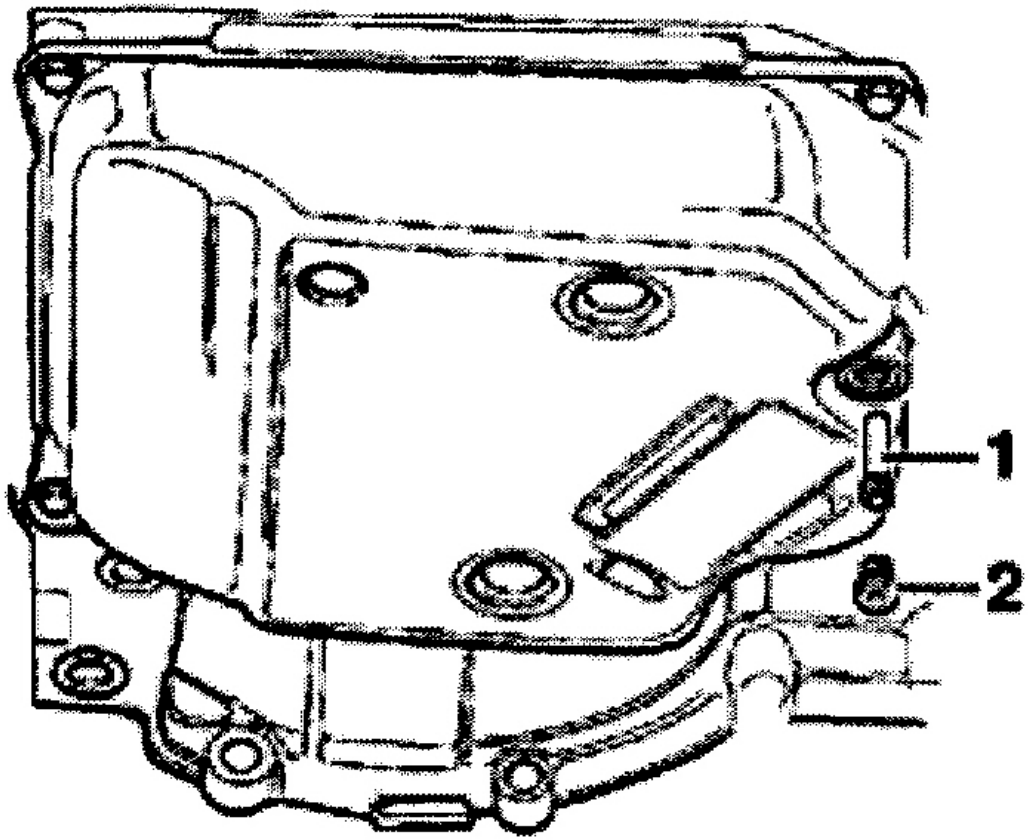
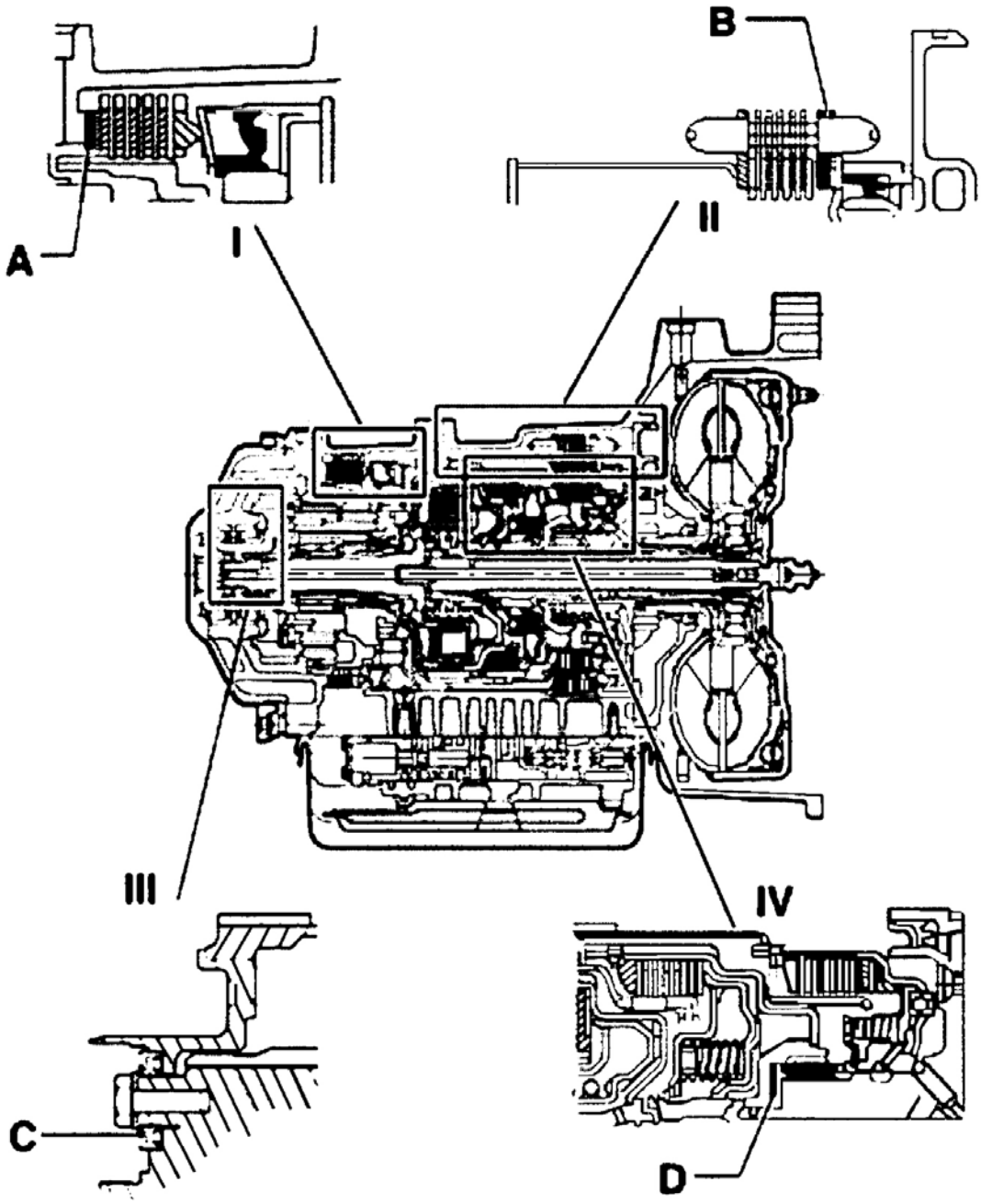


Fig. 86: Pressing In Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing off tapered roller bearing inner race



I = Reverse gear brake -B1-

- A - Shim

II = 2nd and 4th gear brake -B2-

- B - Outer plate or shim

III = Planet carrier

- C - Shim

IV = Clutch play

- D - Shim

G00387941

Fig. 87: Pressing Off Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Separating device Kukko 17/1

Pressing on tapered roller bearing inner race

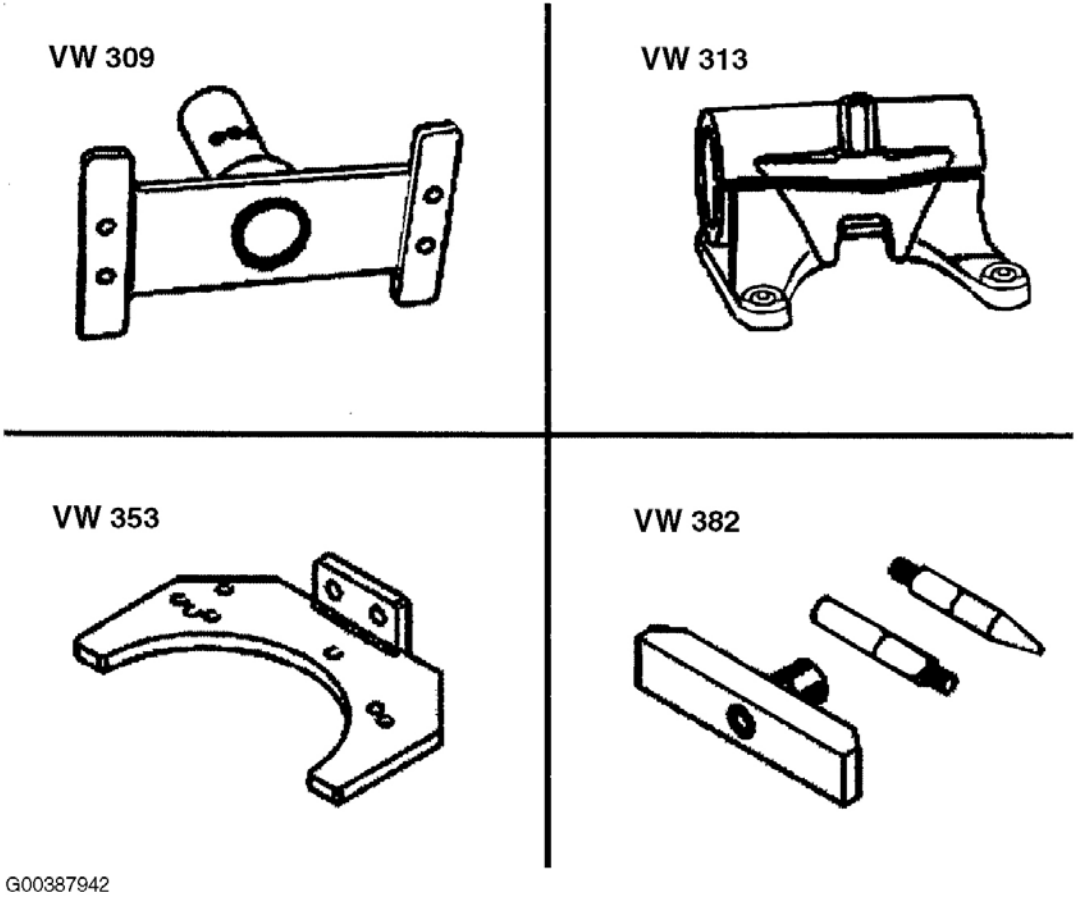
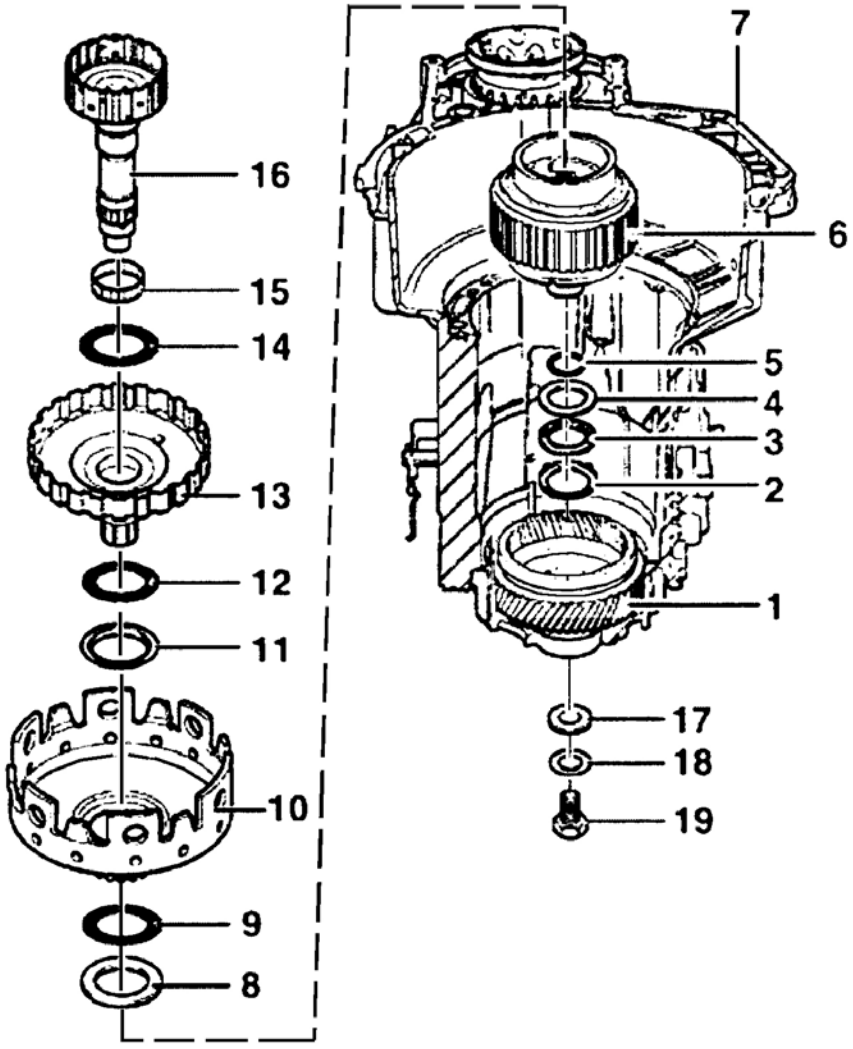


Fig. 88: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing off 4th gear wheel with tapered roller bearing and sleeve



Overview of components to adjust planet carrier

- When adjusting planet carrier install components in transmission housing without shim (item - 17 -).

1 - Input gear

- Do not remove to adjust planet carrier

2 - Axial needle bearing washer

- Insert smooth side in input gear

3 - Axial needle bearing

4 - Axial needle bearing washer

5 - O-ring

6 - Planet carrier

7 - Transmission housing

- With input gear and axial needle bearing
- Axial needle bearing remains in input gear

8 - Washer

9 - Axial needle bearing

10 - Large sun gear

11 - Washer

12 - Axial needle bearing

13 - Large drive shaft

14 - Axial needle bearing

15 - Needle bearing

16 - Small drive shaft

17 - Shim

- Do not install in planet carrier when adjusting

18 - Washer

19 - Small drive shaft bolt, 30 Nm

G00387943

Fig. 89: Pressing Off 4th Gear Wheel With Tapered Roller Bearing And Sleeve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing off 3rd gear wheel

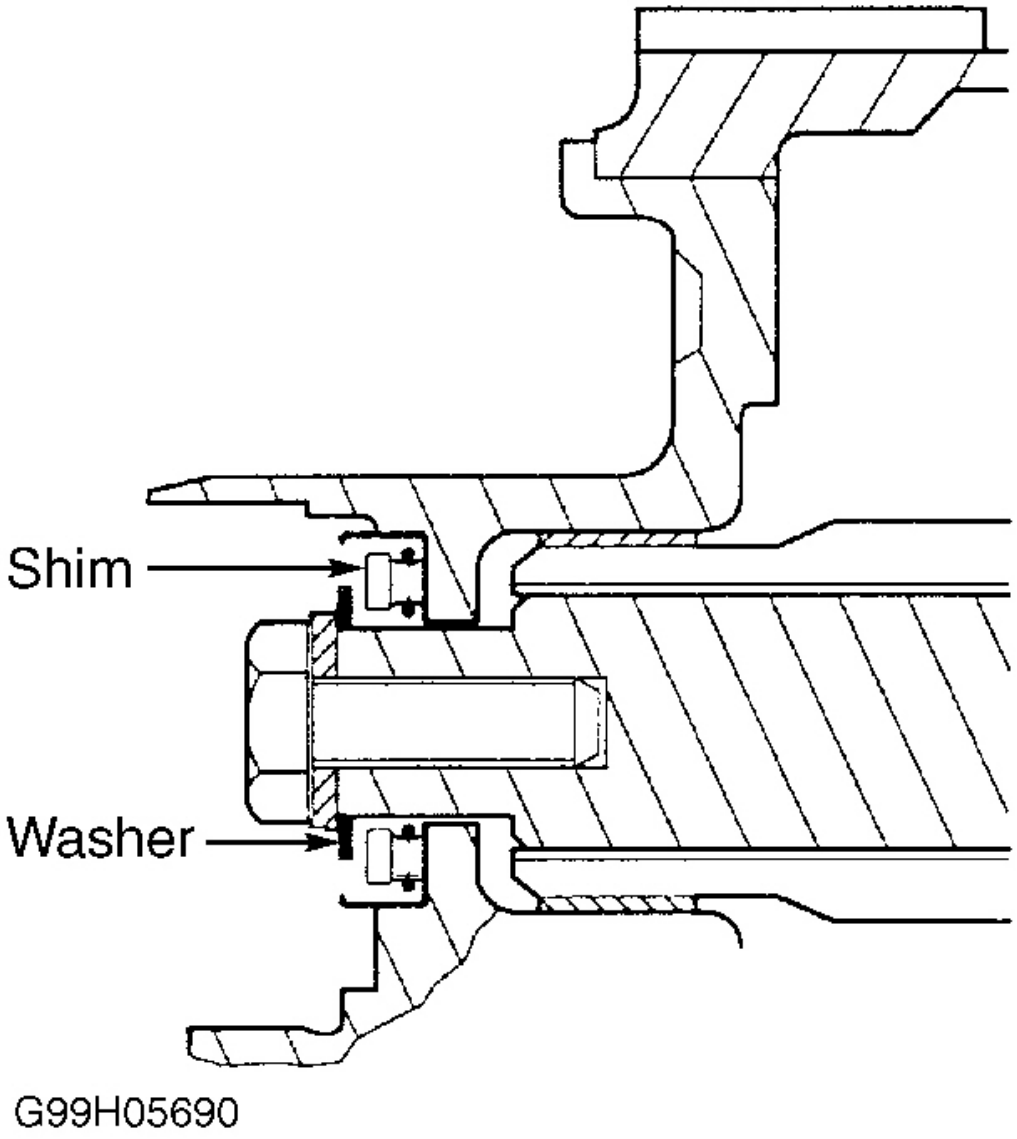


Fig. 90: Pressing Off 3rd Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing on 3rd gear wheel

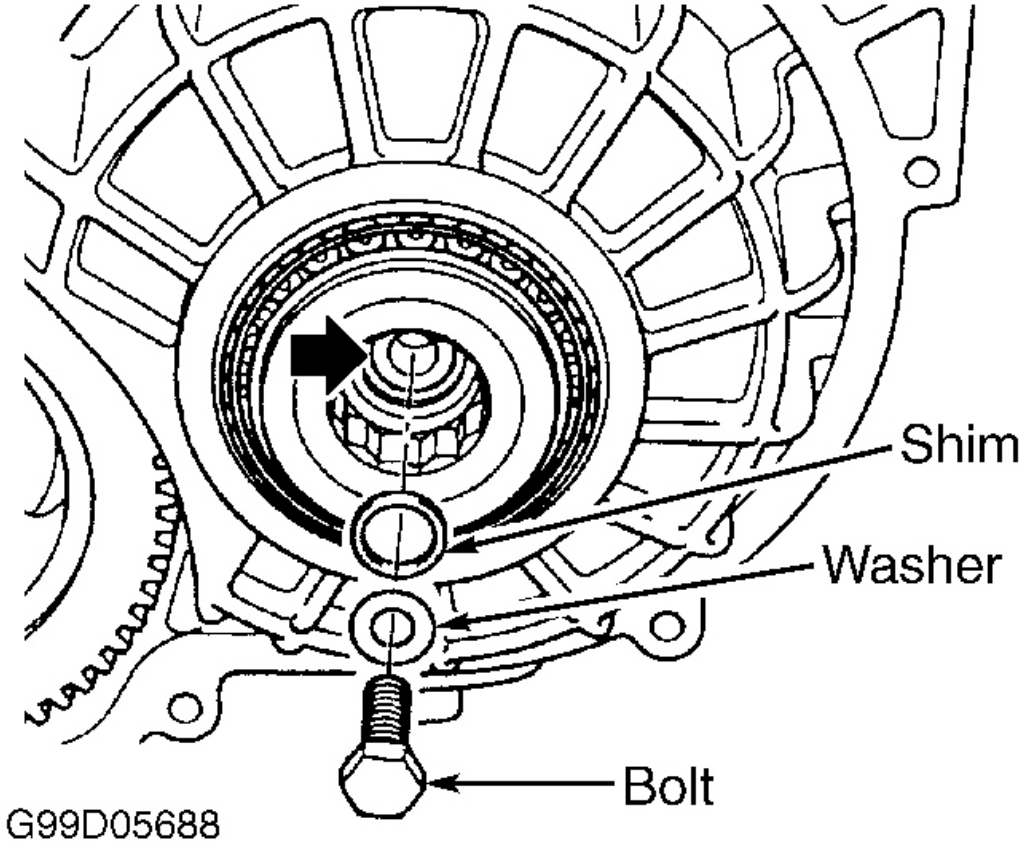


Fig. 91: Pressing On 3rd Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing on 4th gear wheel

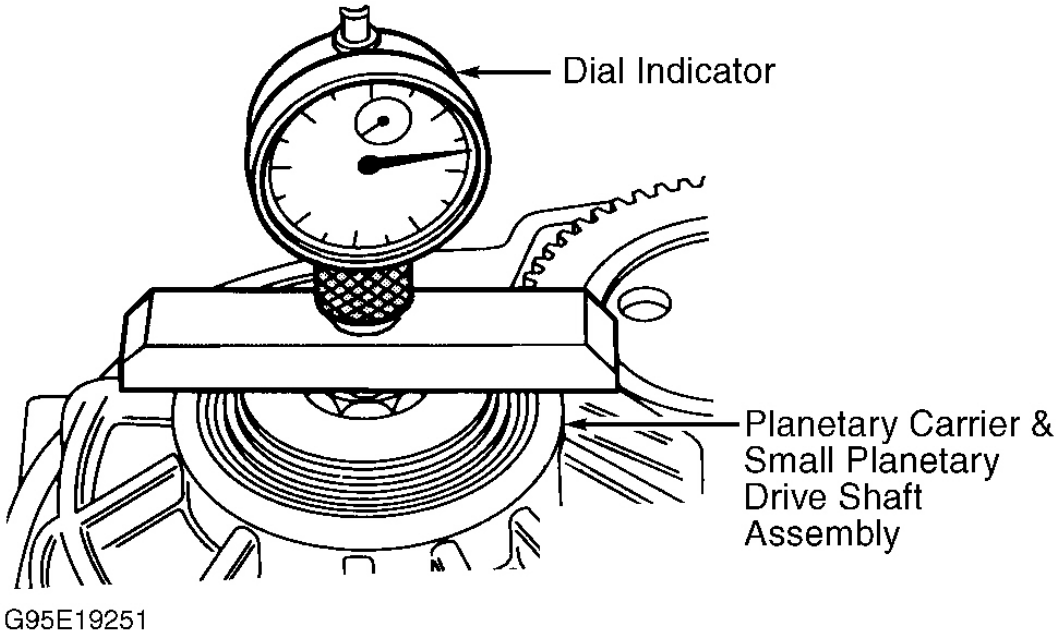


Fig. 92: Pressing On 4th Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Shoulder points to 3rd gear.

Pressing on tapered roller bearing inner race

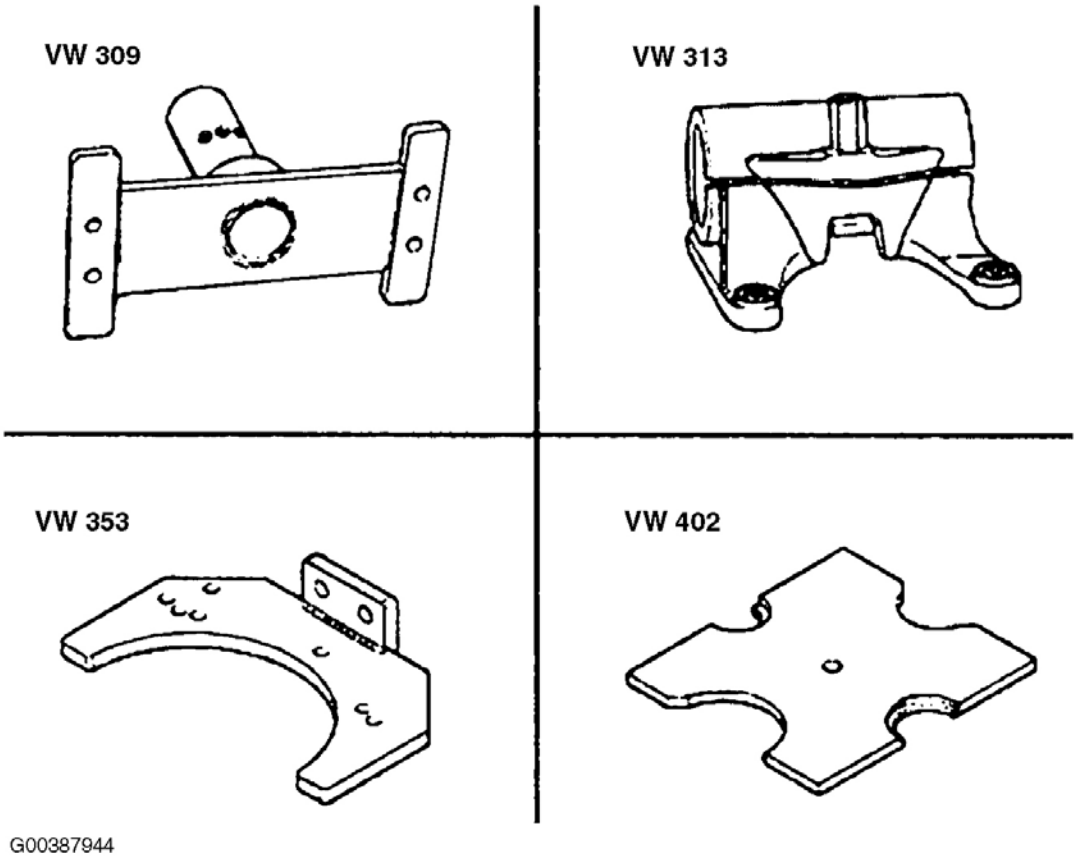
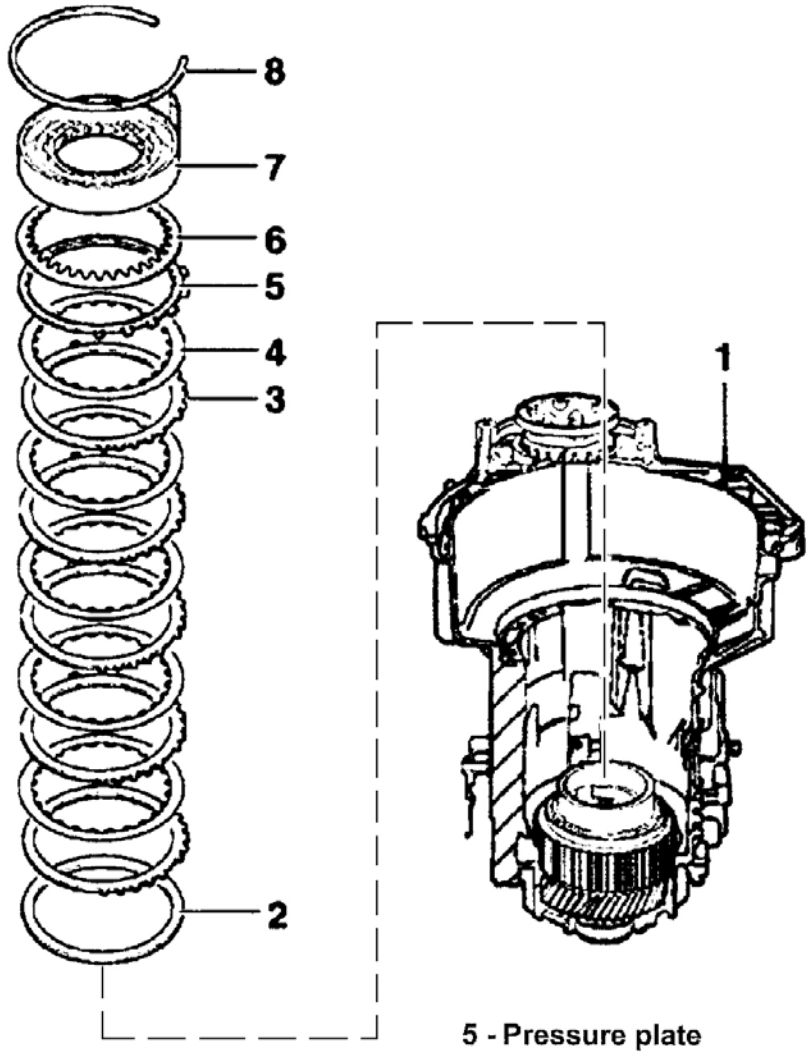


Fig. 93: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing on sleeve for needle roller bearing



1 - **Transmission housing**
- With input gear and planet carrier installed

2 - **Shim**
3 - **Outer plate -B1-**
4 - **Inner plate -B1-**
5 - **Pressure plate**
- Install with flat side facing plates
- Spare part is assigned according to transmission code letters

6 - **Dished washer**
- Convex side faces freewheel

7 - **Freewheel with -B1- piston**
8 - **Circlip**

G00387945

Fig. 94: Pressing On Sleeve For Needle Roller Bearing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing out tapered roller bearing outer race

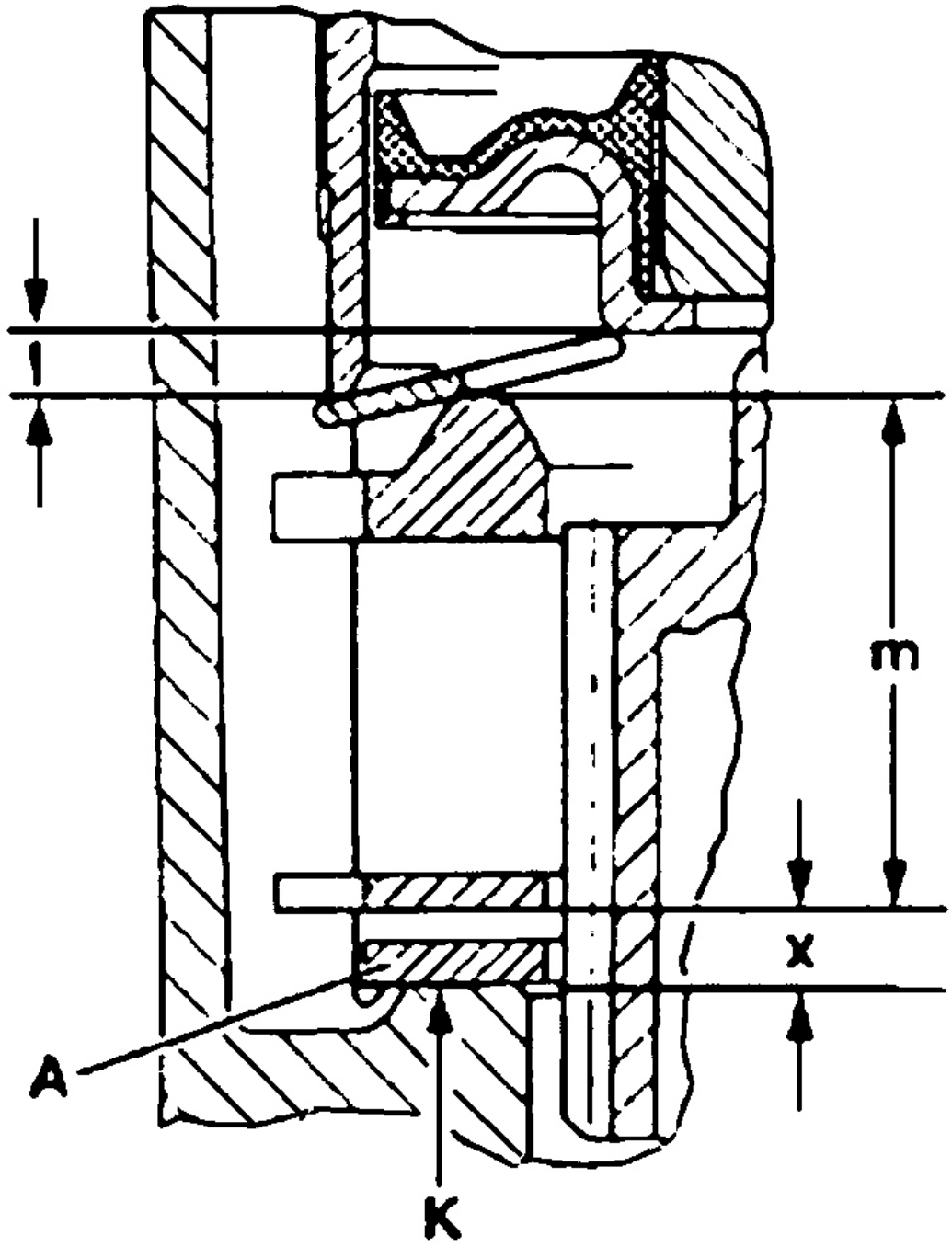


Fig. 95: Pressing Out Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing in tapered roller bearing outer race

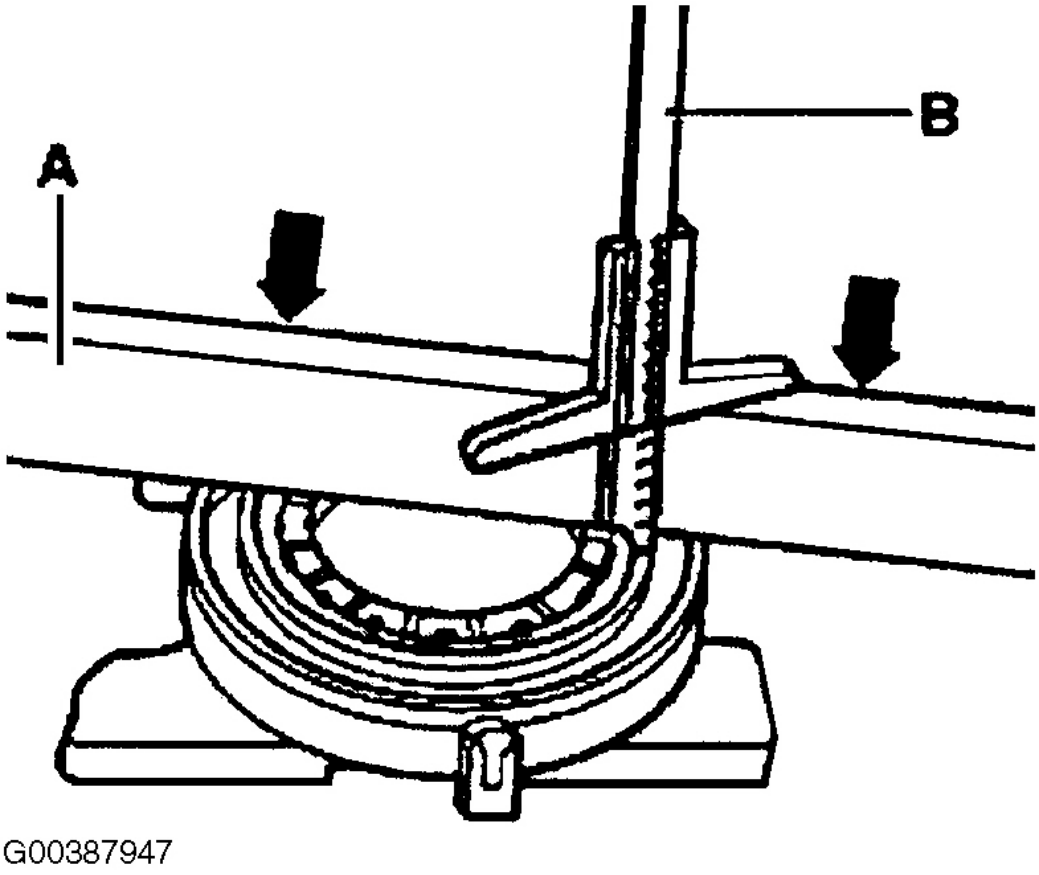


Fig. 96: Pressing In Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install with adjusting shim after adjusting input shaft.

5th gear synchronizer

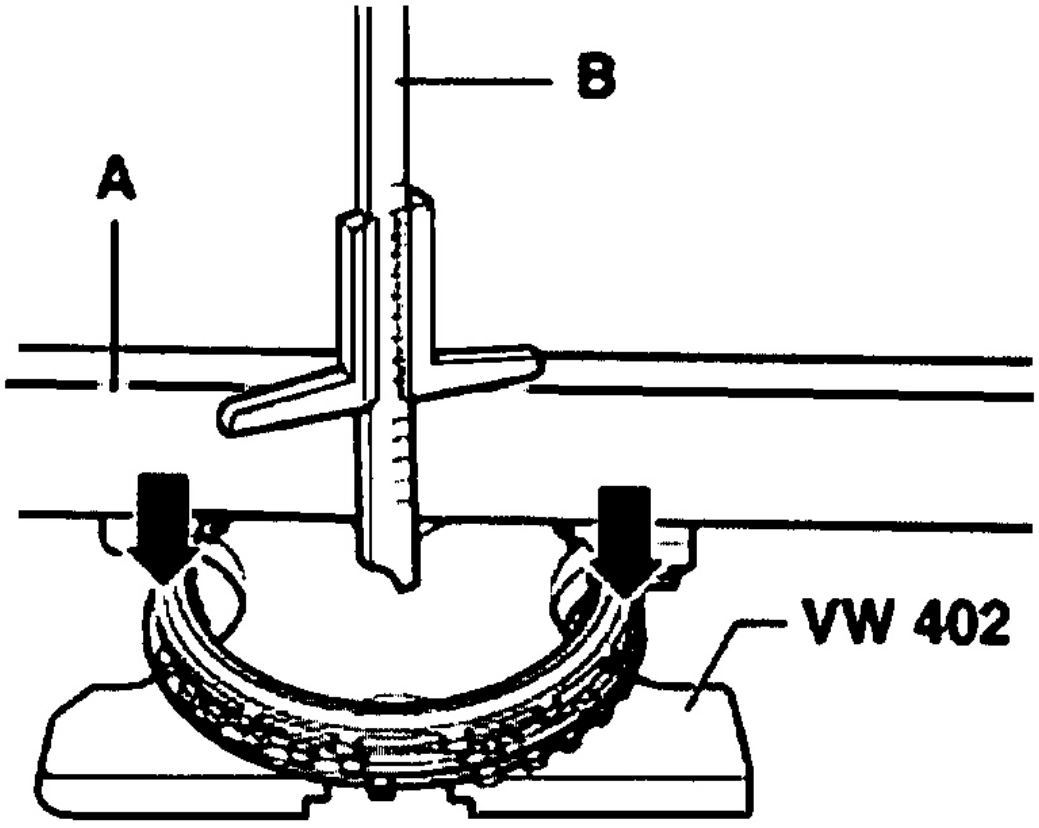


Fig. 97: Identifying 5th Gear Synchronizer
Courtesy of VOLKSWAGEN OF AMERICA, INC.

1. Springs for lock pieces
2. Locking collar

   With 3 recesses (arrows A) for the locking pieces (item 4)

3. Synchro-hub
4. Locking pieces

   Installation position: The thin extension (arrow B) faces the pointed teeth of the locking collar (item -2-)

Assembling 5th gear locking collar/synchro-hub

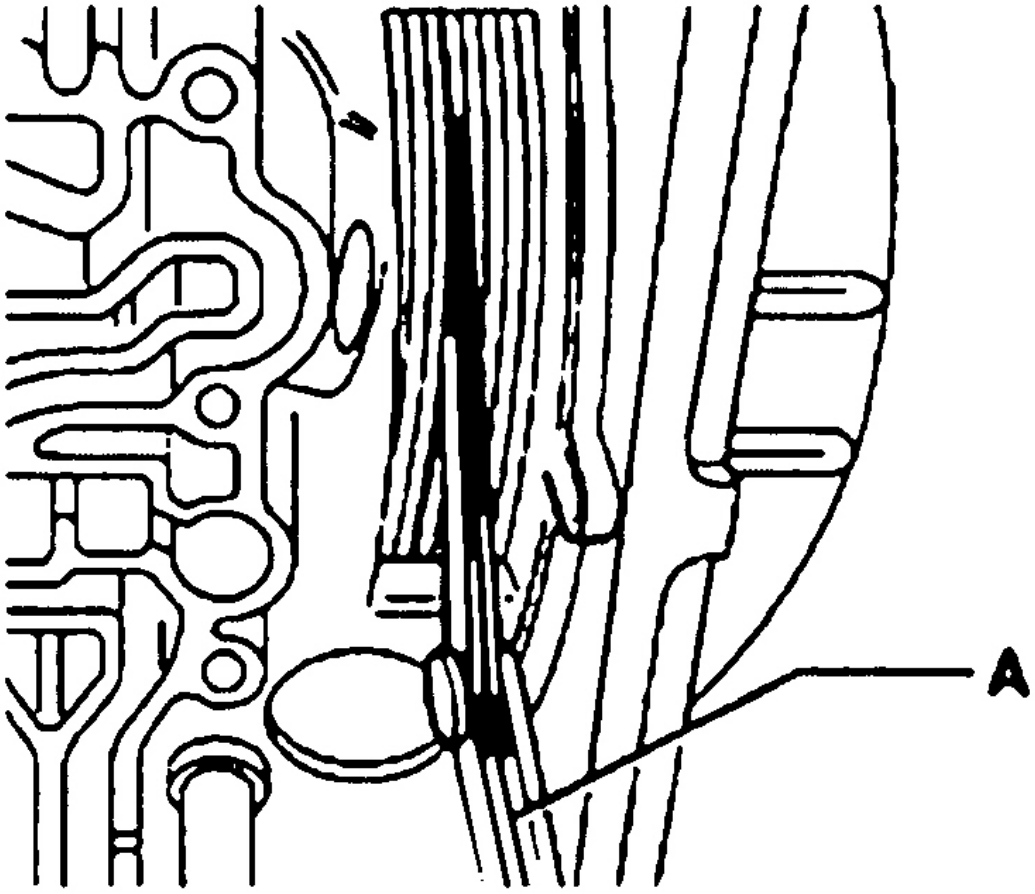


Fig. 98: Assembling 5th Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Push locking collar over synchro-hub.

  Pointed teeth -A- of the locking collar and shoulder -B- of the syncro-hub face in one direction. The cut outs for the locking piece in the locking collar and the syncro-hub must be in-line with one another (See **5th gear synchronizer** and **Fig. 122**).

- Insert locking pieces (Installation position: see **5th gear synchronizer**).
- Insert springs offset by 120° underneath lug - C-. Angled ends of spring must be directly behind locking pieces (arrows).

Changed springs for 5th gear synchronizer from transmission manufacture date November 11 01

- The ends -A- of the springs are bended from the transmission date indicated above.

  The changed springs are installed on both sides.

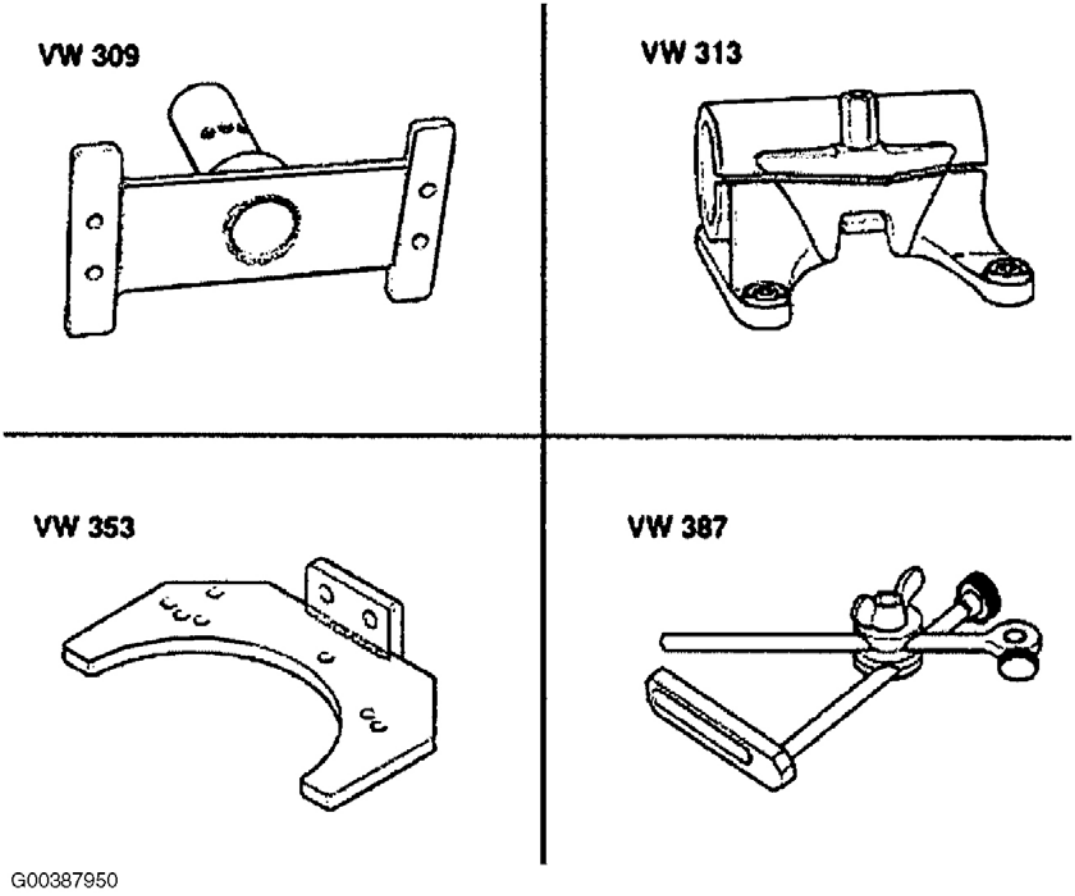
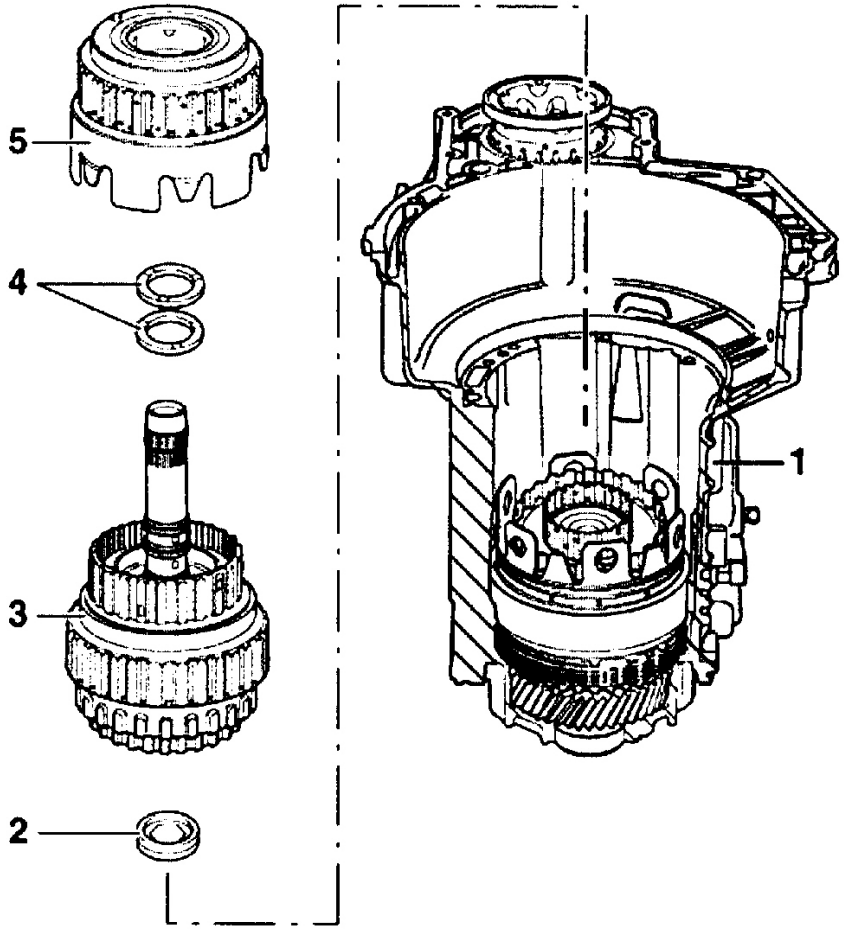


Fig. 99: Installing Changed Springs
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- The changed springs can be installed in previous transmissions only with locking pieces, which are inner hollow.
- Inserting lock pieces (installation position: See **5th gear synchronizer**).
- Installation position of the springs:
- Insert springs offset by 120°.
- The spring must secure with the angled end -A- in the hollow lock piece.



1 - Transmission housing

2 - Axial needle bearing with washer

- Axial needle bearing faces small input shaft
- Washer faces toward-K3-

3 - 1st to 3rd gear clutch -K1- with 3rd and 4th gear clutch -K3-

- The clutches -K1- and -K3- are pressed together

4 - Shims

- Do not install when adjusting clutch play
- 1 or 2 shims can be installed

5 - Reverse gear clutch -K2-

G00387951

Fig. 100: Locating Installation Position Of Springs
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The spring must be under the lug -B- from the locking piece.

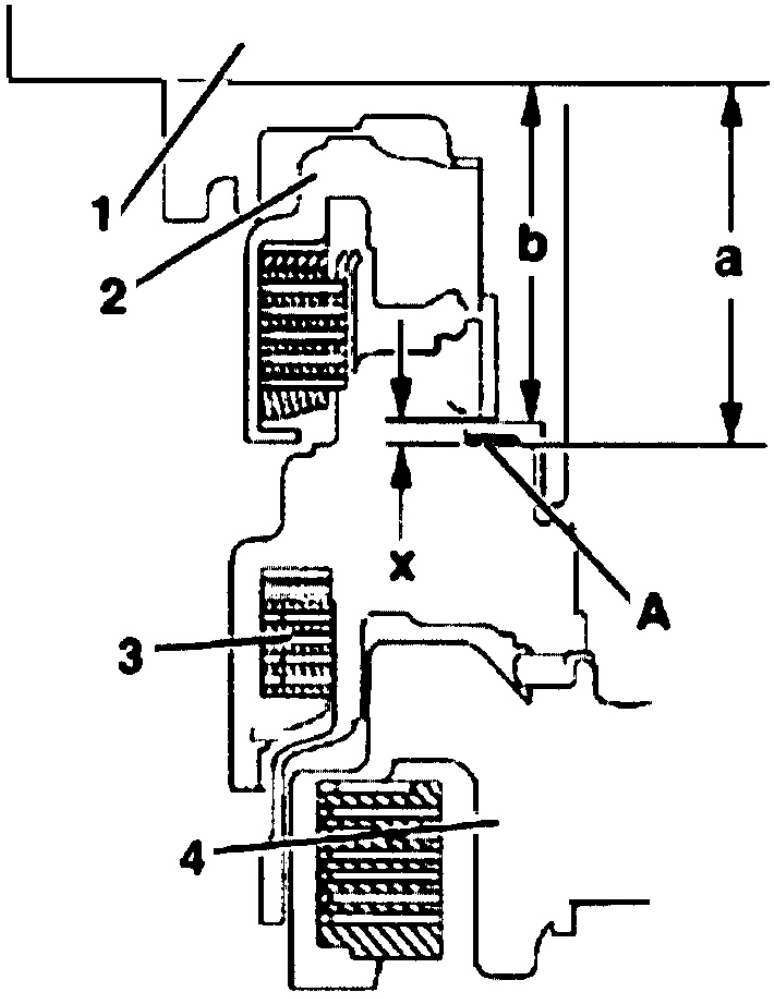
The bended end points always from synchronizer body (direction of arrow).

INPUT SHAFT, ADJUSTING

(Determining input shaft adjustment shim)

Special tools and equipment

- VW 387 Universal dial gauge bracket
- VW 385/17 End measuring plate
- VW510 Press piece
- VW 447 i Thrust plate
- VW 407 Press tool
- V.A.G 1331 Torque wrench
- Measuring dial gauge



A - Shim
1 - ATF pump
2 - Reverse gear clutch -K2-
3 - 1st to 3rd gear clutch -K1-
4 - 4th gear clutch -K3-

G00387952

Fig. 101: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

It is necessary to readjust the input shaft when the following components are replaced:

- Transmission housing
- Clutch housing
- Input shaft
- 4th gear wheel

  or the

- Tapered roller bearings

Adjustment overview. See **Adjustment overview**

- Press tapered roller bearing outer race without shim into transmission housing onto stop, using VW 510.

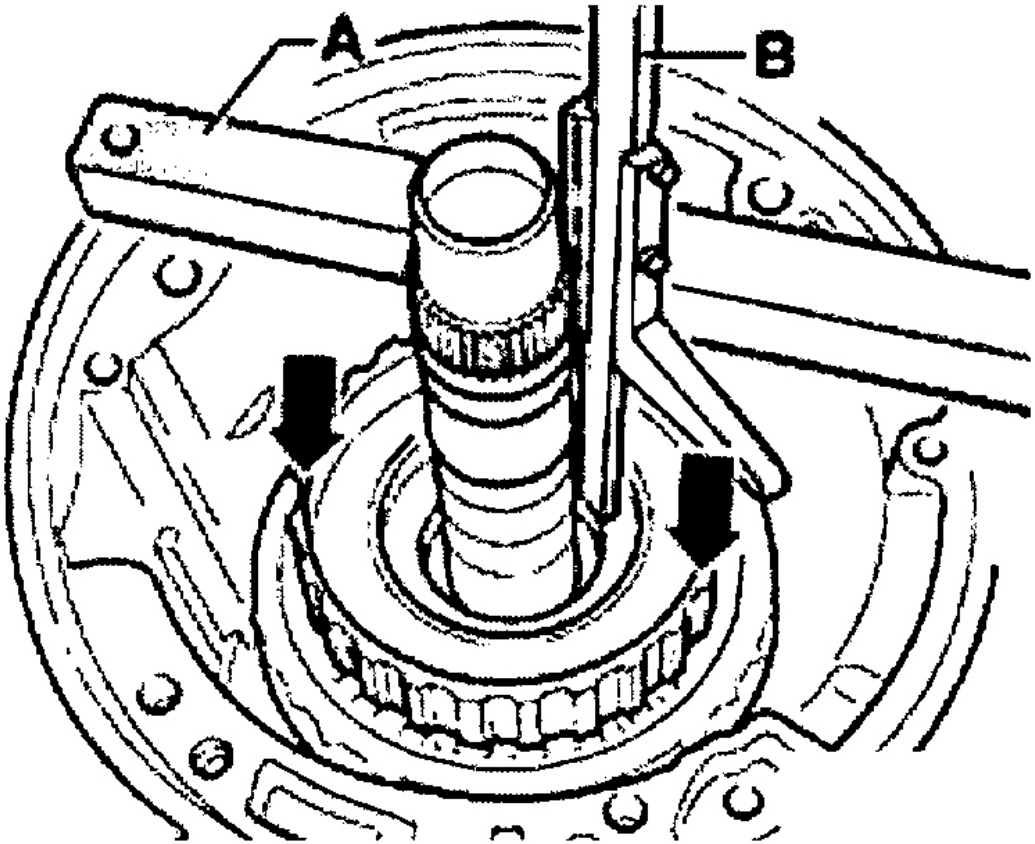
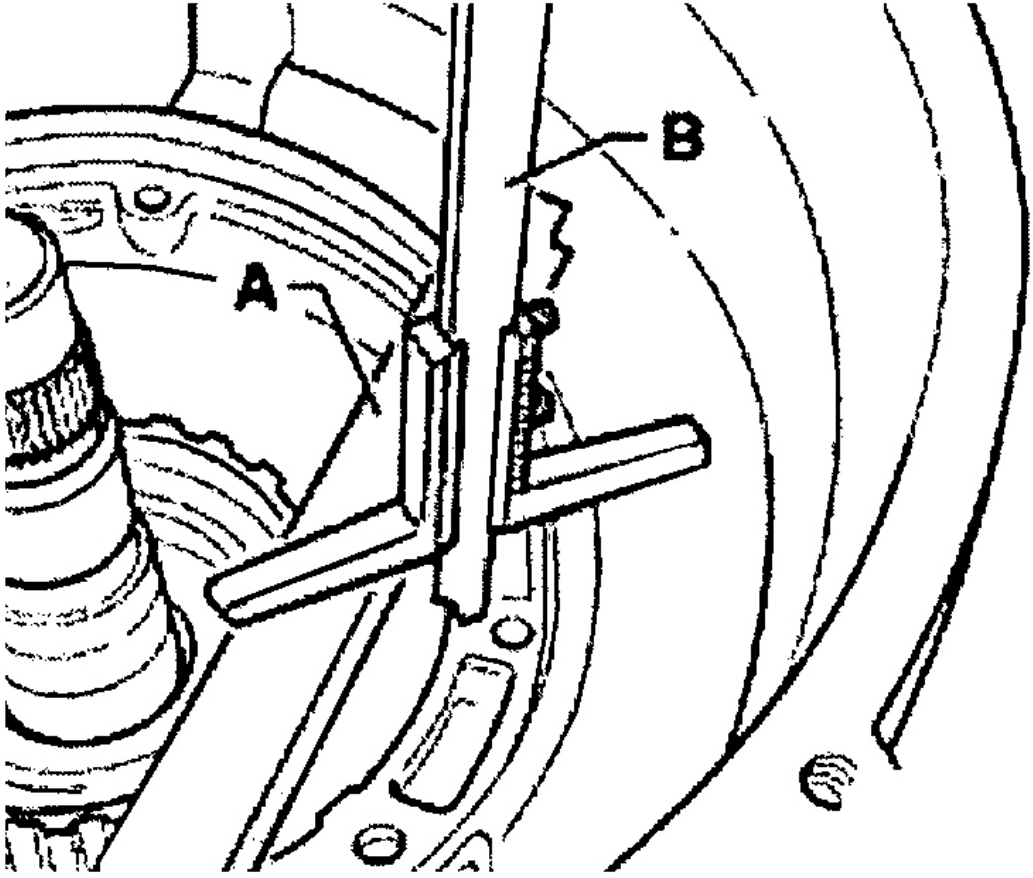


Fig. 102: Installing Tapered Roller Bearing Outer Race

Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install input shaft in clutch housing and assemble transmission housing. Tighten hex head bolts to 25 N.m and then turn an additional 90°.
- Install dial indicator in clutch housing (large tapered roller bearing in transmission housing).
- Before taking any measurements, rotate input shaft to allow bearings to settle. Set dial gauge to "O" with 1 mm preload.



G00387954

Fig. 103: Installing Dial Indicator In Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: This preparation is to be repeated for each subsequent measurement, otherwise the gauge will not return to the starting position.

- Press input shaft in direction of dial indicator (arrow).
- Read and note clearance indicated on dial indicator (example 1.21).

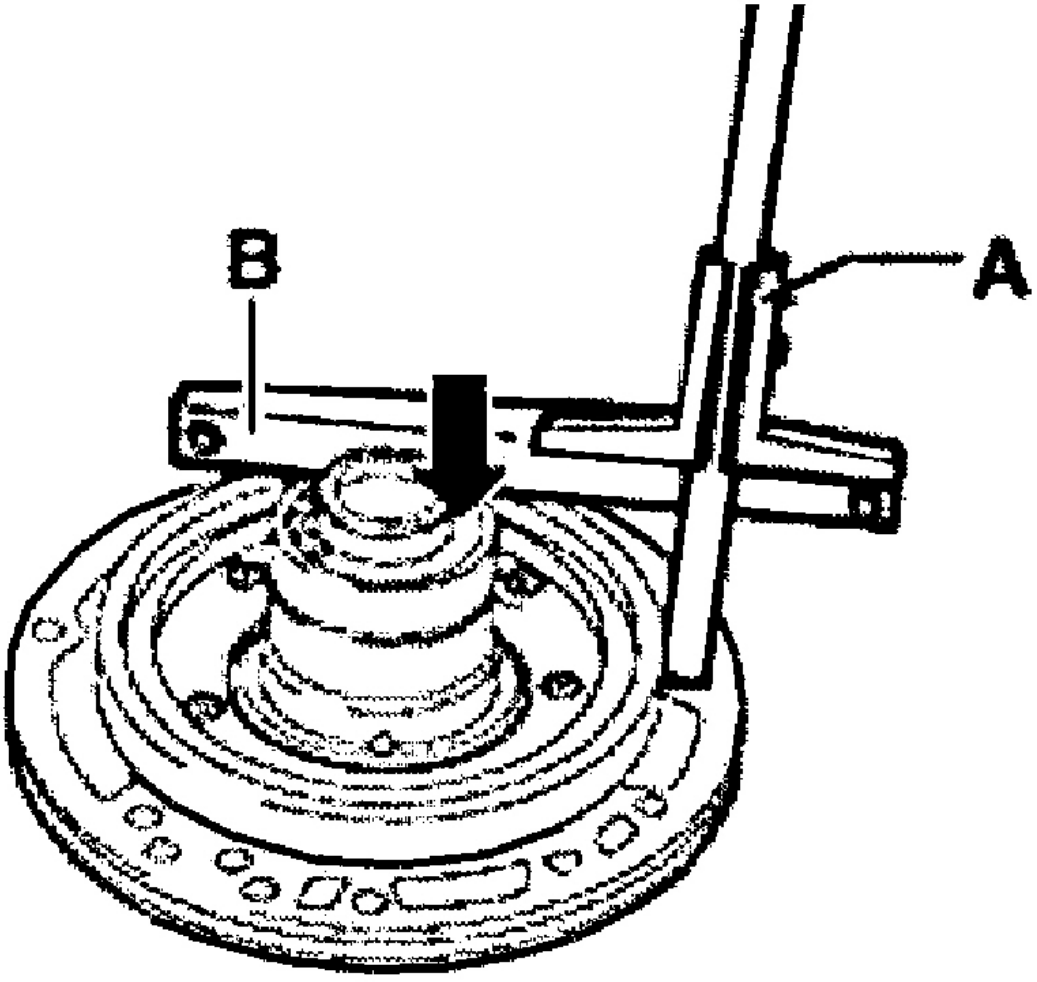


Fig. 104: Measuring Input Shaft Clearance
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Dial indicator does not return to original position.

- Determine thickness of shim from table. See **TABLE OF ADJUSTMENT SHIMS** .
- Remove input shaft and press tapered roller bearing outer race out of transmission housing using VW 447i.

- Press tapered roller bearing outer race together with 1.175 shim into transmission housing using VW 510.
- Assemble transmission housing and tighten hex head bolts to 25 N.m and then turn an additional 90°.

Table of adjustment shims

ADJUSTMENT SHIMS (INPUT SHAFT)

Measured	Shim	
bearing clearance (mm)	Thickness (mm)	Part No.
0.671 ... 0.699	0.650	02A 311 140
0.700 ... 0.724	0.675	02A 311 140 A
0.725 ... 0.749	0.700	02A 311 140 B
0.750 ... 0.774	0.725	02A 311 140 C
0.775 ... 0.799	0.750	02A 311 140 D
0.800 ... 0.824	0.775	02A 311 140 E
0.825 ... 0.849	0.800	02A 311 140 F
0.850 ... 0.874	0.825	02A 311 140 G
0.875 ... 0.899	0.850	02A 311 140 H
0.900 ... 0.924	0.875	02A 311 140 J
0.925 ... 0.949	0.900	02A 311 140 K
0.950 ... 0.974	0.925	02A 311 140 L
0.975 ... 0.999	0.950	02A 311 140 M
1.000 ... 1.024	0.975	02A 311 140 N
1.025 ... 1.049	1.000	02A 311 140 P
1.050 ... 1.074	1.025	02A 311 140 Q
1.075 ... 1.099	1.050	02A 311 140 R
1.100 ... 1.124	1.075	02A 311 140 S
1.125 ... 1.149	1.100	02A 311 140 T
1.150 ... 1.174	1.125	02A 311 140 AA
1.175 ... 1.199	1.150	02A 311 140 AB
1.200 ... 1.224	1.175	02A 311 140 AC
1.225 ... 1.249	1.200	02A 311 140 AD
1.250 ... 1.274	1.225	02A 311 140 AE
1.275 ... 1.229	1.250	02A 311 140 AF
1.300 ... 1.324	1.275	02A 311 140 AG
1.325 ... 1.349	1.300	02A 311 140
1.350 ... 1.374	1.325	02A 311 140
1.375 ... 1.399	1.350	02A 311 140 A 02A 311 140 A
1.400 ... 1.424	1.375	02A 311 140 A 02A 311 140 B
1.425 ... 1.449	1.400	02A 311 140 B

		02A 311 140 B
1.450 ... 1.474	1.425	02A 311 140 B 02A 311 140 C
1.475 ... 1.499	1.450	02A 311 140 C 02A 311 140 C
1.500 ... 1.524	1.475	02A311 140 C 02A311 140 D
1.525 ... 1.549	1.500	02A 311 140 D 02A 311 140 D
1.550 ... 1.574	1.525	02A 311 140 D 02A 311 140 E
1.575 ... 1.599	1.550	02A 311 140 E 02A 311 140 E
1.600 ... 1.624	1.575	02A 311 140 E 02A 311 140 F
1.625 ... 1.649	1.600	02A 311 140 F 02A 311 140 F
1.650 ... 1.674	1.625	02A 311 140 F 02A 311 140 G
1.675 ... 1.699	1.650	02A 311 140 G 02A 311 140 G
1.700 ... 1.724	1.675	02A 311 140 G 02A 311 140 H
1.725 ... 1.749	1.700	02A 311 140 H 02A 311 140 H
1.750 ... 1.774	1.725	02A 311 140 H 02A 311 140 J
1.775 ... 1.791	1.750	02A 311 140 J 02A 311 140 J

Measurement, checking

- Install measuring appliance and dial gauge

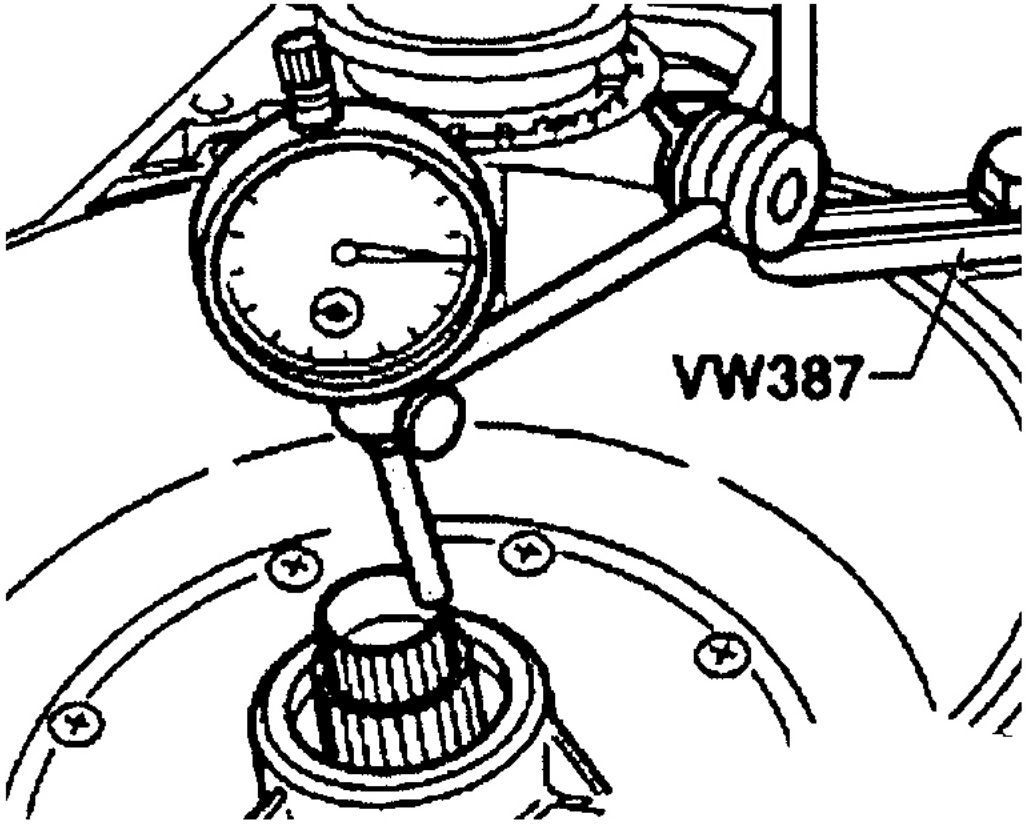


Fig. 105: Installing Measuring Appliance And Dial Gauge
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Rotate input shaft so that tapered roller bearings settle.
- Press input shaft in direction of arrow.

Bearing play should be min. 0.01 ... max. 0.09 mm.

NOTE: If the bearing clearance cannot be measured, but input shaft play is perceptible and the input shaft turns freely, the adjustment is acceptable.

OUTPUT SHAFT, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 407 Press tool
- VW412 Press tool
- VW512 Press disk
- V.A.G 1582 Puller
- V.A.G 1582/4 Grip piece
- V.A.G 1582/5 Grip piece

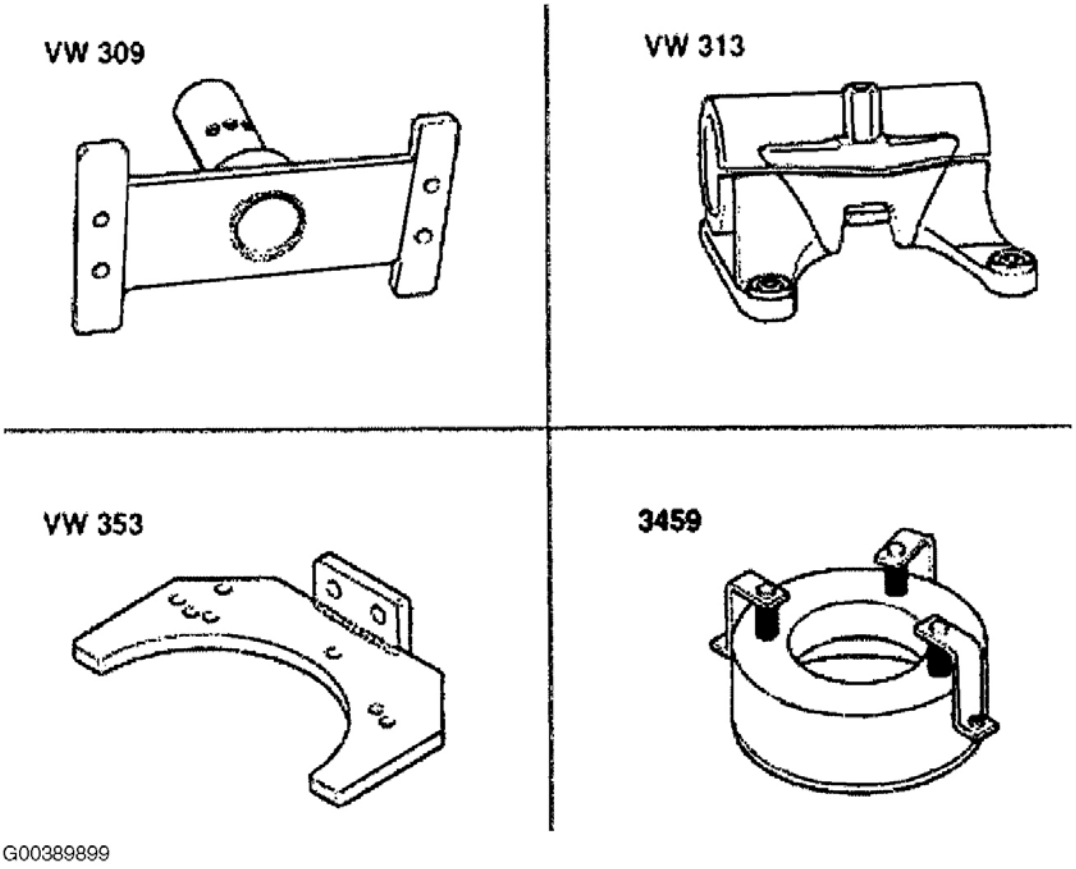
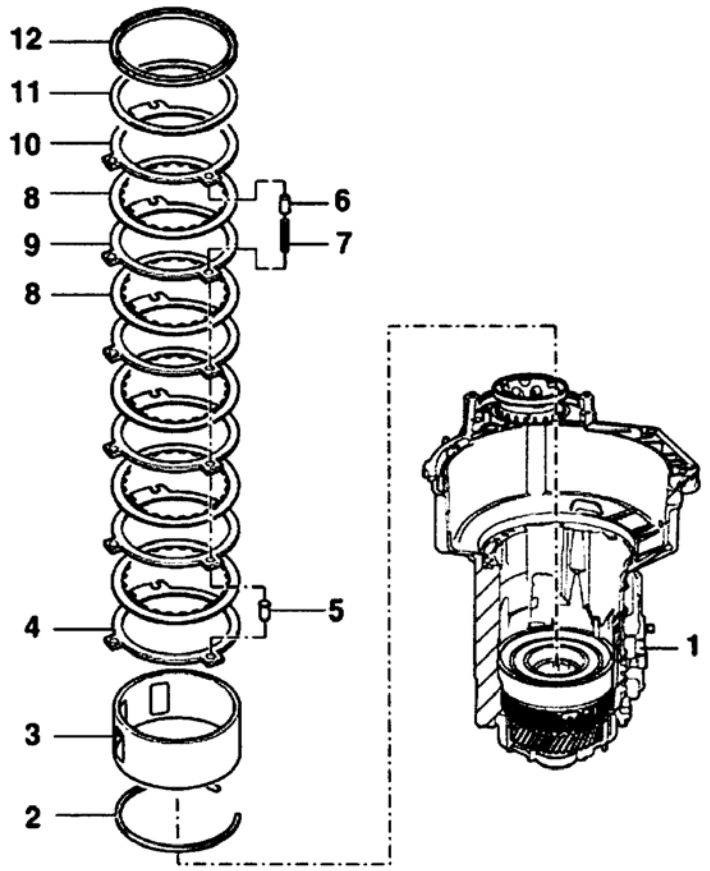


Fig. 106: Identifying Special Tools And Equipment (1 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VW 402 Press plate
- 32-111 Thrust piece
- VW 408 A Press tool
- VW 409 Press tool
- VW 457 Support rails
- VW 519 Tube



1 - Transmission housing

2 - Circlip
- For supporting tube

3 - Supporting tube -B2-
- Replacement part is assigned according to transmission code letters
- Insert so that notch locates on freewheel wedge

4 - Outer plate -B2-
- 3 mm thick

5 - Spring cap
- Install after installing first outer plate (item - 4 -)

6 - Spring cap
- Do not install when adjusting -B2-
- Install before installing last outer plate

7 - Spring
- Replacement part is assigned according to transmission code letters

8 - Inner plate -B2-
- Replacement part is assigned according to transmission code letters

9 - Outer plate -B2-
- Always install 2 mm thick outer plates

10 - Outer plate -B2-
- 3 mm thick
- Do not install when adjusting -B2-

11 - Shim
- Do not install when adjusting -B2-

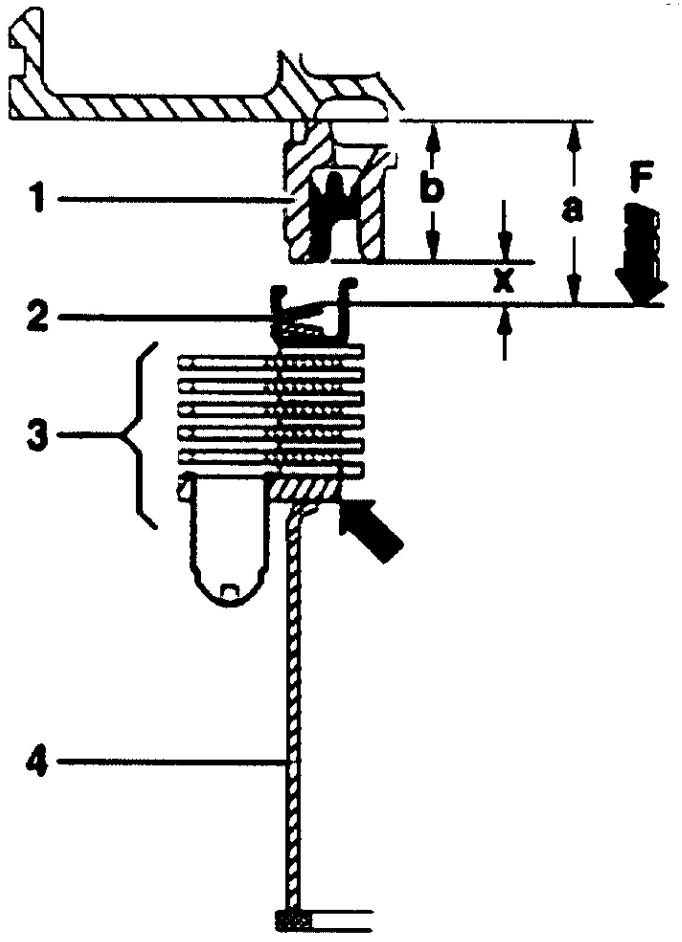
12 - Retaining ring
- Inserted with smooth side facing last inner plate (item - 8 -) when adjusting - B2-.

G00389900

Fig. 107: Identifying Special Tools And Equipment (2 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VW 429 Thrust ring

- VW 415 A Tube
- VW 447 H Press plate
- VW 454 Press piece
- VW 455 Fitting sleeve
- 41-501 Drift sleeve



1 - ATF pump

2 - Retaining ring

3 - Plates for -B2- without last outer plate

4 - Supporting tube

G00389901

Fig. 108: Identifying Special Tools And Equipment (3 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 1 - Kukko 21/6 Internal extractor

- 4 - Kukko 22/2 Retainer

NOTE:

- **The output shaft is disassembled as follows:**
  - **Position separating device under 2nd gear wheel (item 19) and press off as described in Pressing off 3rd and 4th gear synchro-hub/locking collar, 2nd, 3rd and 4th gear wheels with transmission housing needle roller bearing sleeve .**
  - **Remove circlip (item 15).**
  - **Position two-arm puller under bearing support (item 9) and pull off locking collar with 1st and 2nd gear synchro-hub as described in. See Pulling off locking collar with synchro-hub and bearing support .**
- **When installing new gear wheels or a new output shaft consult technical data. See Code letters, transmission application, ratios, capacities .**
- **Both tapered roller bearings must be replaced as a set.**

NOTE: The following list refers to items in Fig. 109 .

1. **Hex nut, 25 N.m plus an additional 1/4 turn 90°**
   - 4 nuts for bearing support
2. **Clutch housing**
3. **Shim**
   - For output shaft
   - Adjustment overview. See **Adjustment overview**
4. **Small tapered roller bearing outer race**
   - Removing. See **Output shaft, disassembling and assembling**
   - Pressing in. See **Pressing in small tapered roller bearing outer race**
5. **Small tapered roller bearing inner race**
   - Pulling off. See **Pulling off small tapered roller bearing inner race**
   - Pressing on **Pressing on small tapered roller bearing inner race**
6. **Output shaft**
   - Is paired with final drive gear wheel, always replace together as a set
   - Adjusting. See **OUTPUT SHAFT, ADJUSTING**
7. **Large tapered roller bearing inner race**
   - Pulling off. See **Pulling off large tapered roller bearing inner race**
   - Pressing on **Pressing on large tapered roller bearing inner race**
8. **Sealing ring**
   - Place sealing rings (Qty. 4) on bearing support bolts
9. **Bearing support**
   - With large tapered roller bearing outer race and bolts

- Only change outer race with large tapered roller bearing and bearing support

10. **Thrust washer**
    - Shoulder on thrust washer faces tapered roller bearing
11. **1st gear wheel**
    - From transmission manufacture date May 02 00 the synchronizer for 1st gear was changed. See **CHANGED SPRINGS FOR 5TH GEAR SYNCHRONIZER FROM TRANSMISSION MANUFACTURE DATE NOVEMBER 11 01**
12. **Needle roller bearing**
    - For 1st gear
13. **1st gear synchro-ring**
    - Checking for wear. See **Checking synchro-ring for wear**
    - Identification **Identifying 1st and 2nd gear synchro-rings**
    - From transmission manufacture date May 02 00 the synchronizer for 1st gear was changed. See **CHANGED SPRINGS FOR 5TH GEAR SYNCHRONIZER FROM TRANSMISSION MANUFACTURE DATE NOVEMBER 11 01**
14. **1st and 2nd gear locking collar with synchro-hub**
    - Pull off with bearing support after removing circlip (item 15). See **Pulling off locking collar with synchro-hub and bearing support**
    - Disassembling **Disassembling and assembling 1st and 2nd gear locking collar and synchro-hub**
    - Assembling locking collar/synchro hub. See **Disassembling and assembling 1st and 2nd gear locking collar and synchro-hub** and **Assembling 1st and 2nd gear locking collar/synchro-hub**
    - Installation position. See **Installation position 1st and 2nd gear locking collar/synchro-hub**
    - Pressing on **Pressing on 1st and 2nd gear locking collar/synchro-hub**
    - From transmission manufacture date May 02 00 the synchronizer for 1st gear was changed. See **CHANGED SPRINGS FOR 5TH GEAR SYNCHRONIZER FROM TRANSMISSION MANUFACTURE DATE NOVEMBER 11 01**
15. **Securing clip**
16. **2nd gear synchro-ring**
    - Identification **Identifying 1st and 2nd gear synchro-rings**
    - Checking for wear. See **Checking 2nd gear synchro-ring for wear**
    - Assemble so that recesses locate in locking collar (item 14) locking pieces
    - From transmission manufacture date May 02 00 the synchronizer for 1st gear was changed. See **CHANGED SPRINGS FOR 5TH GEAR SYNCHRONIZER FROM TRANSMISSION MANUFACTURE DATE NOVEMBER 11 01**
17. **Outer ring**
    - Insert in synchro-ring (item 16). Installation position. See **Installation position outer-ring**
    - Replace if scored or worn
18. **Synchro-ring**
    - (Inner ring)

- Checking for wear. See **Installation position 1st and 2nd gear locking collar/synchro-hub** .
- Check lugs for scoring
- Installation position. See **Installation position synchro-ring (inner-ring)**

19. **2nd gear wheel**
    - Installation position. See **Installation position 2nd gear wheel**
20. **Needle roller bearing**
    - For 2nd gear
21. **Thrust washer**
22. **Sleeve for 3rd gear needle roller bearing**
    - Pressing off with 2nd gear wheel. See **Pressing off 3rd and 4th gear synchro-hub/locking collar, 2nd, 3rd and 4th gear wheels with transmission housing needle roller bearing sleeve**
    - Pressing on **Pressing on needle roller bearing sleeve for 3rd gear**
23. **Needle roller bearing**
    - For 3rd gear
24. **3rd gear wheel**
25. **3rd gear synchro-ring**
    - Checking for wear. See **Checking synchro-ring for wear**
26. **Locking collar with 3rd and 4th gear synchro-hub**
    - Press off with 2nd gear wheel (item 19) and 3rd gear wheel (item 24). See **Pressing off 3rd and 4th gear synchro-hub/locking collar, 2nd, 3rd and 4th gear wheels with transmission housing needle roller bearing sleeve**
    - Disassembling. See **Disassembling and assembling 3rd and 4th gear locking collar and synchro-hub**
    - Installation position locking collar/synchro-hub. See **Installation position 3rd and 4th gear locking collar/synchro-hub**
    - Assembling locking collar/synchro-hub. See **Disassembling and assembling 3rd and 4th gear locking collar and synchro-hub** and **Assembling 3rd and 4th gear locking collar/synchro-hub**
    - Pressing on **Pressing on 3rd and 4th gear synchro-hub with locking collar**
27. **Sleeve**
    - For needle roller bearing
    - Press off with locking collar and 3rd and 4th gear synchro-hub (item 26). See **Pressing off 3rd and 4th gear synchro-hub/locking collar, 2nd, 3rd and 4th gear wheels with transmission housing needle roller bearing sleeve**
    - Pressing on **Pressing on sleeve for 4th gear needle roller bearing**
28. **Needle roller bearing**
    - For 4th gear
29. **4th gear synchro-ring**
    - Checking for wear. See **Checking synchro-ring for wear**
30. **4th gear wheel**

31. **Thrust washer**
32. **Needle roller bearing**
    - For output shaft
    - Removing and installing. See **Driving out needle roller bearing**
33. **Transmission housing**
34. **Sleeve**
    - For output shaft needle roller bearing
    - Pressing off. See **Pressing off 3rd and 4th gear synchro-hub/locking collar, 2nd, 3rd and 4th gear wheels with transmission housing needle roller bearing sleeve**
    - Pressing on **Pressing on sleeve for output shaft needle roller bearing**
35. **5th gear wheel**
    - Removing and installing. See **Assembly sequence**
36. **Saucer spring washer**
    - Installation position. See **Installation position of dished spring for gear wheel and 5th gear synchro-hub securing bolts:**
37. **Torx socket head bolt M10, 80 N.m**
    - Installed portion on bolt head holds saucer spring washer in position

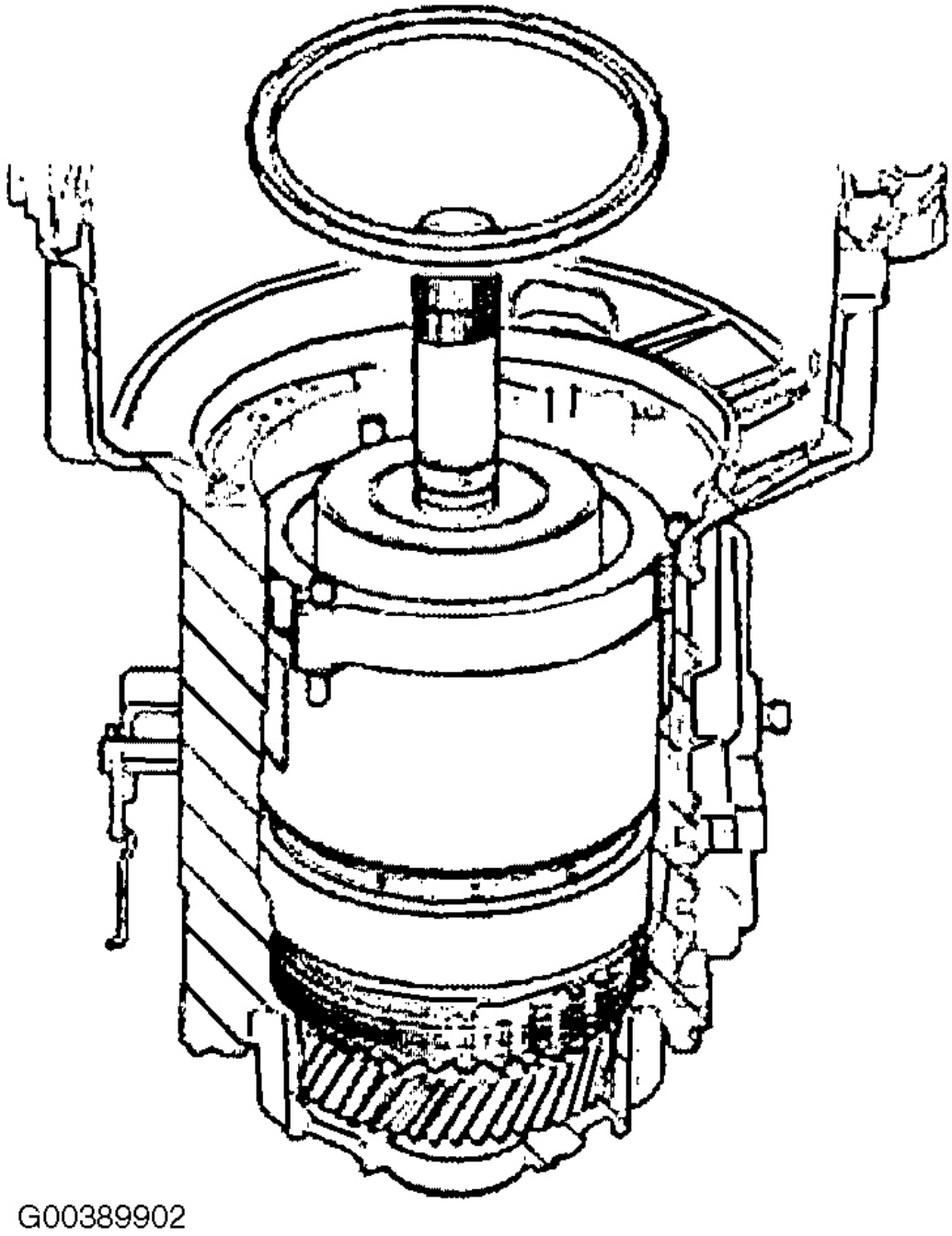
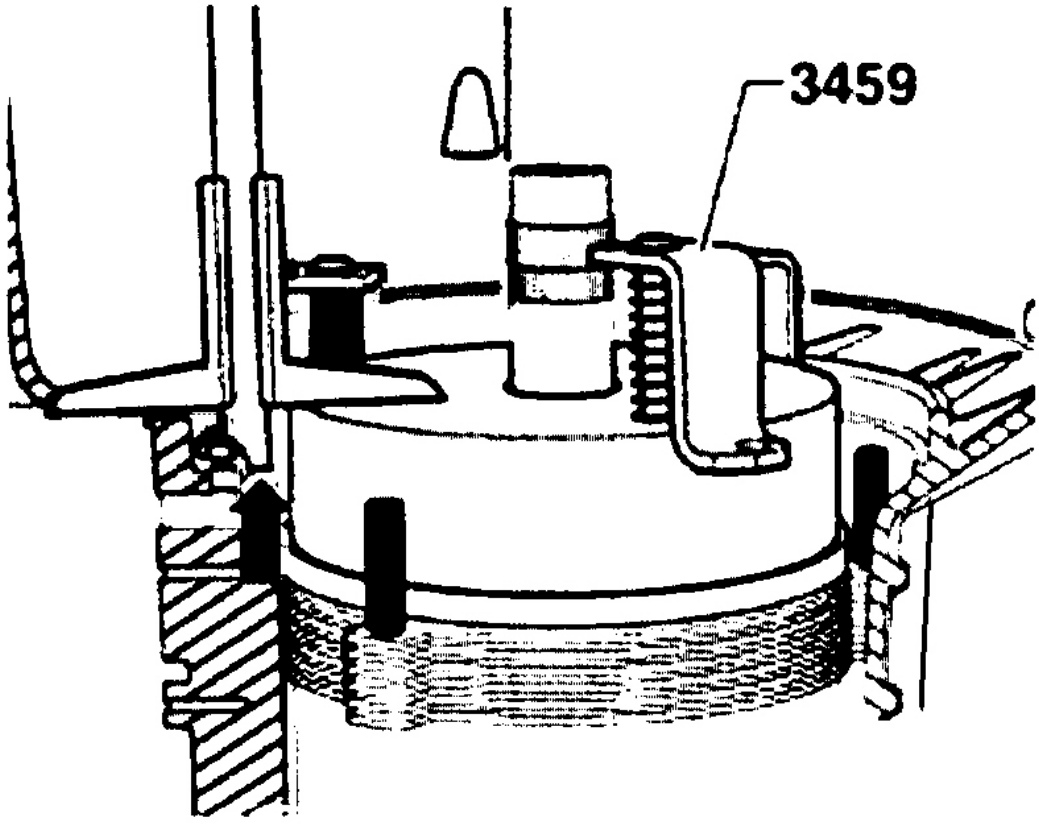


Fig. 109: Disassembled View Of Output Shaft
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling out small tapered roller bearing outer race



G00389903

Fig. 110: Pulling Out Small Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Internal extractor 37 ... 46 mm, e.g. Kukko 21/6
B. Counter support, e.g. Kukko 22/2

Pressing in small tapered roller bearing outer race

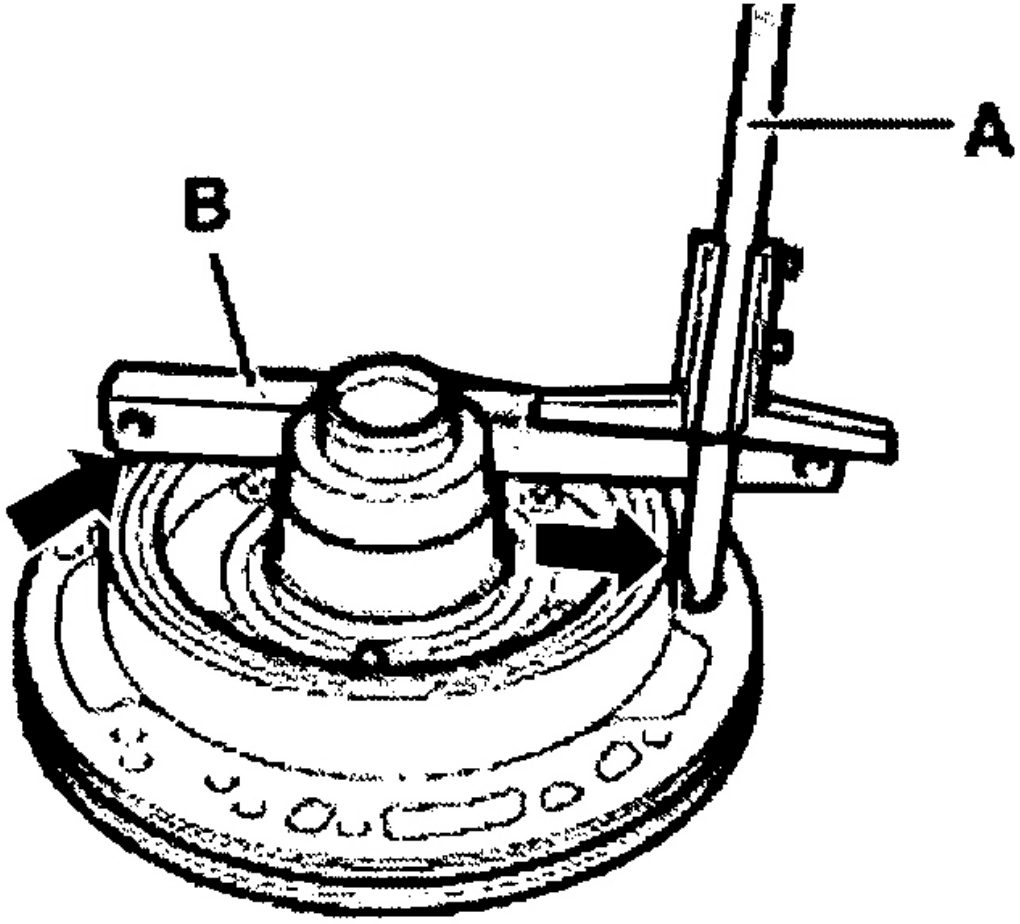


Fig. 111: Pressing In Small Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling off small tapered roller bearing inner race

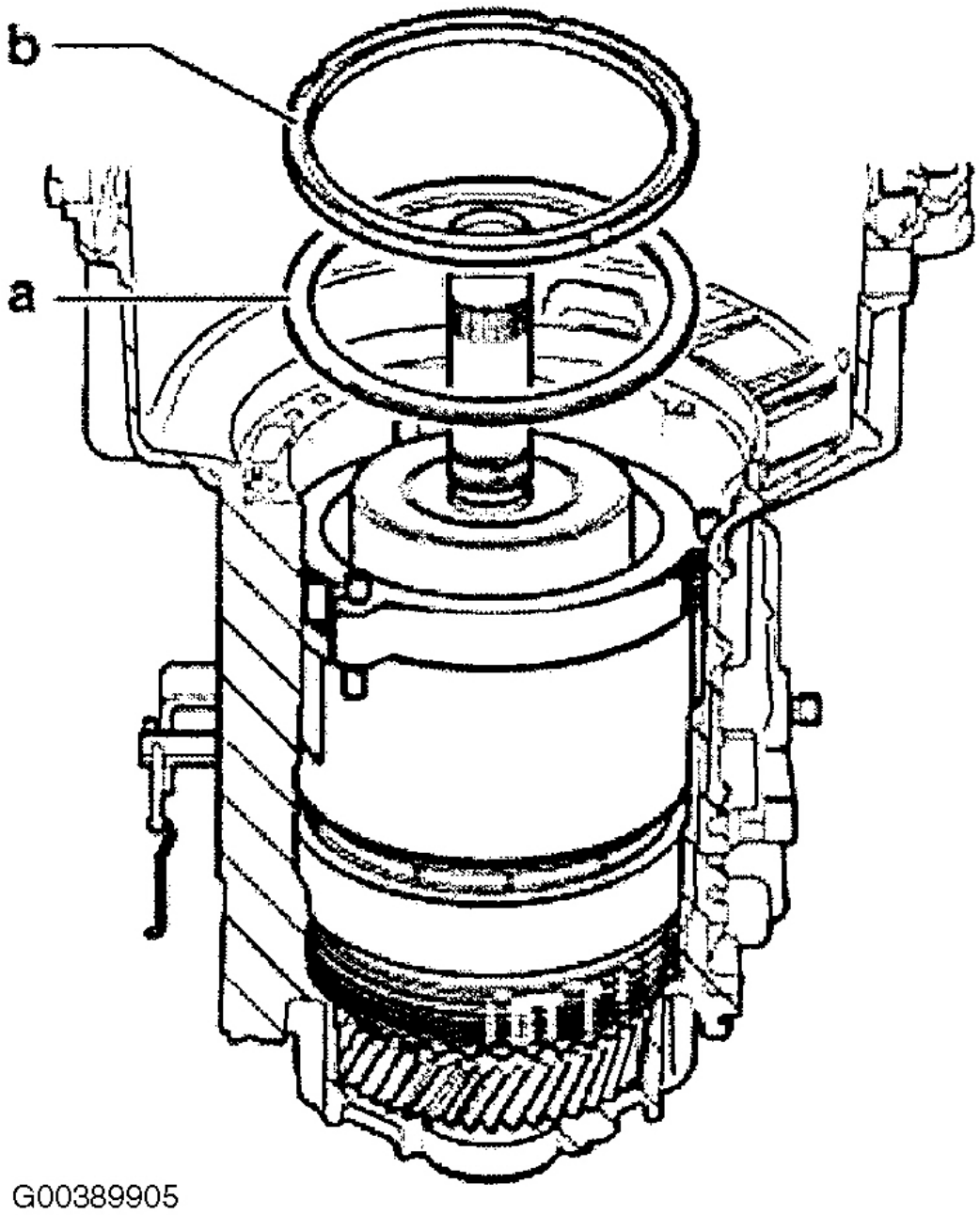
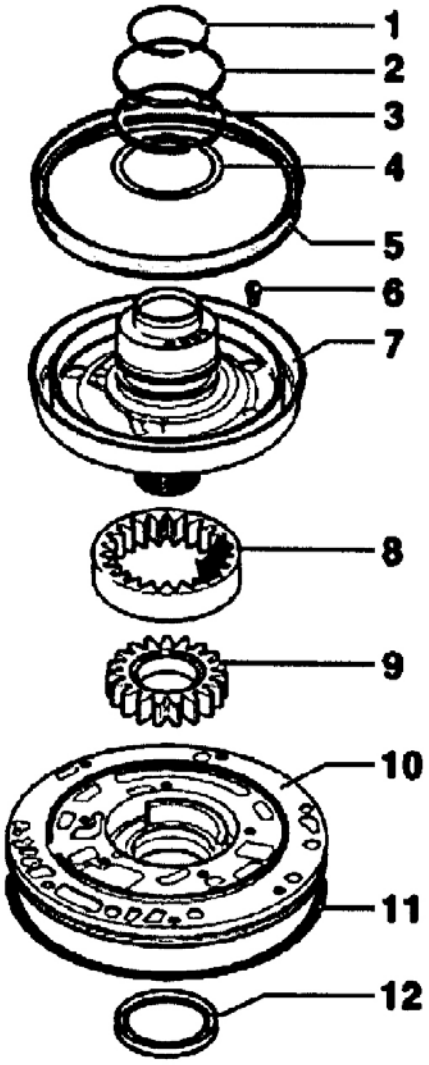


Fig. 112: Pulling Off Small Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Vice clamps/vice
    - Install gripping device and tension behind bearing rollers, then turn bearing and retension gripping

device.

Pressing on small tapered roller bearing inner race



1 - **Piston ring**
2 - **Piston ring**
3 - **Piston ring**
4 - **Thrust washer**
5 - **Piston**
- Sealing lips are vulcanized to the piston
- Moisten sealing lips with ATF before inserting
- Turn piston slightly when installing

6 - **Bolt, 10 Nm**
- Then turn 45° further

7 - **Stator support**
8 - **Outer gear**
- Manufacturer's marking (arrow) faces stator support
- If outer gear is incorrectly installed, ATF pump may not operate freely in installed position

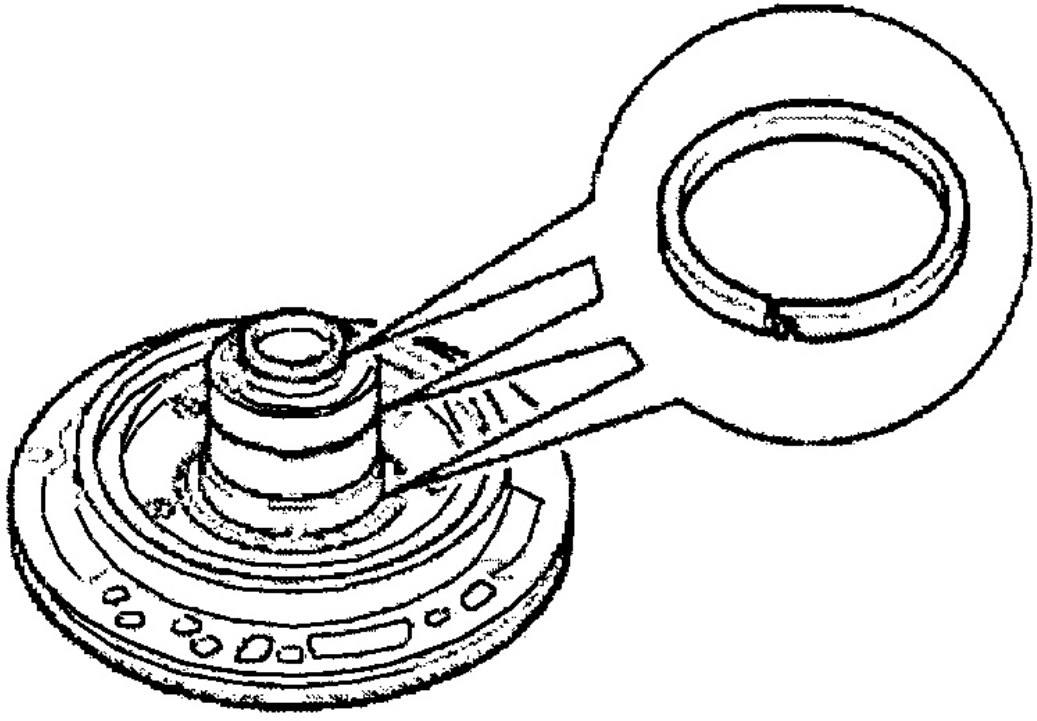
9 - **Inner gear**
- Larger groove faces stator support

10 - **Housing for ATF pump**
11 - **O-ring**
- Always replace

12 - **Torque converter oil seal**

Fig. 113: Pressing On Small Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing off 3rd and 4th gear synchro-hub/locking collar, 2nd, 3rd and 4th gear wheels with transmission housing needle roller bearing sleeve



G00389907

Fig. 114: Pressing off 3rd and 4th gear synchro-hub/locking collar, 2nd, 3rd and 4th gear wheels with transmission housing needle roller bearing sleeve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Separating device 22 ... 115 mm, e.g. Kukko 17/2
B. Hex bolt 17 mm AF - M10 x 20

NOTE: Support separating appliance so that the 1st and 2nd gear locking collar is not pulled off at the same time.

Pulling off locking collar with synchro-hub and bearing support

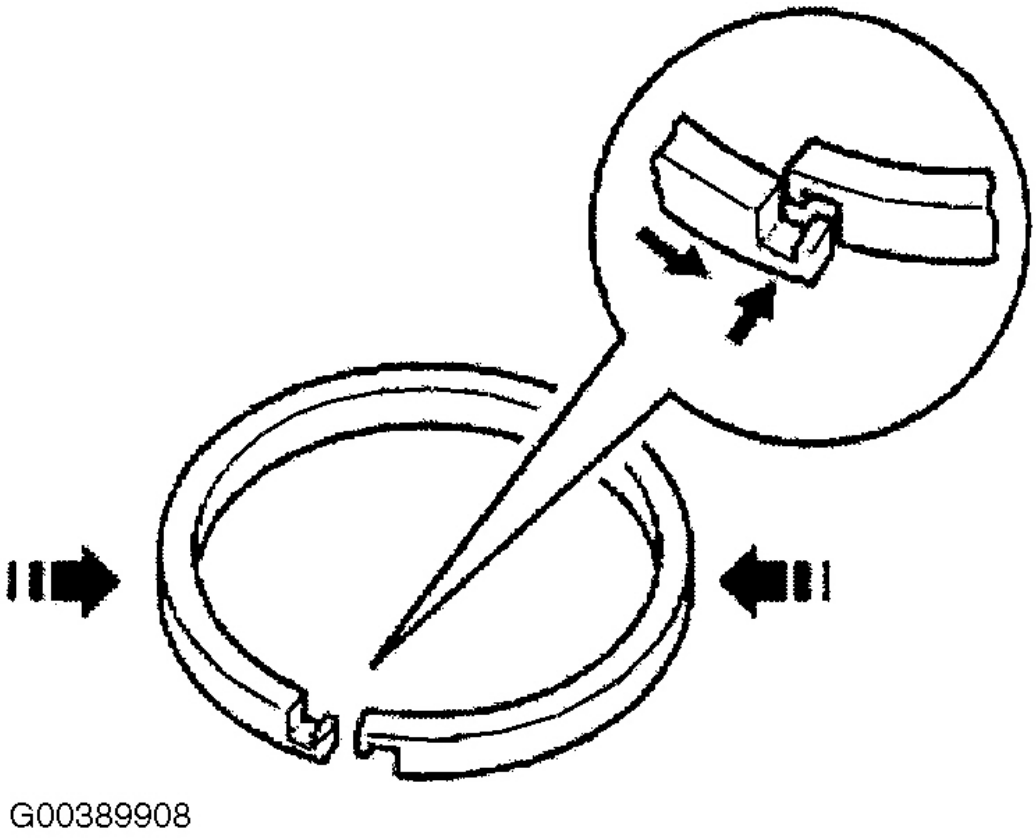
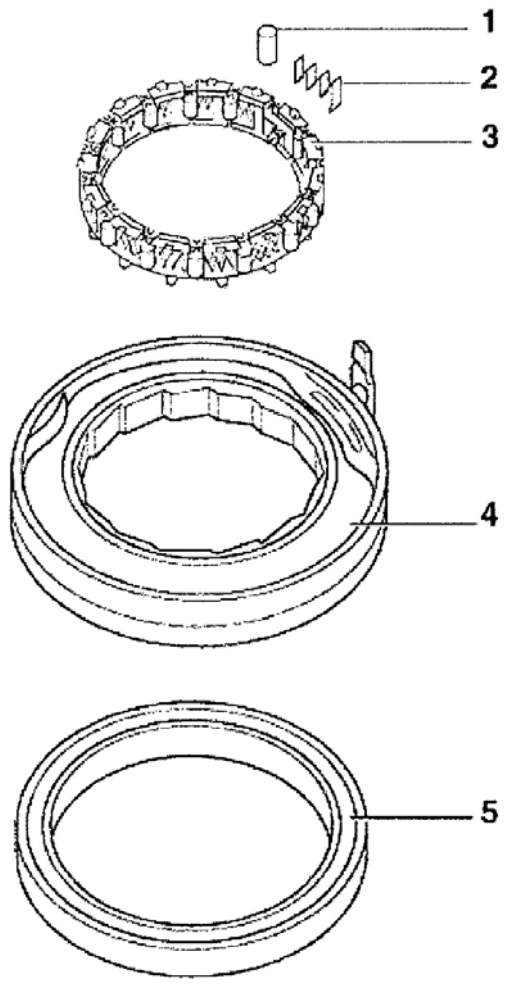


Fig. 115: Pulling Off Locking Collar With Synchro-Hub And Bearing Support
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- First remove the circlip -arrow-.

Pulling off large tapered roller bearing inner race



1 - Rollers

2 - Springs

3 - Cage

4 - Outer ring

5 - Piston

- Sealing lips are vulcanized to the piston
- Moisten sealing lips with ATF before installing
- Turn piston slightly when installing

G00389909

Fig. 116: Pulling Off Large Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Vice clamps

- Before installing puller insert a M 10 x 20 hex bolt in output shaft drilling.

Pressing on large tapered roller bearing inner race

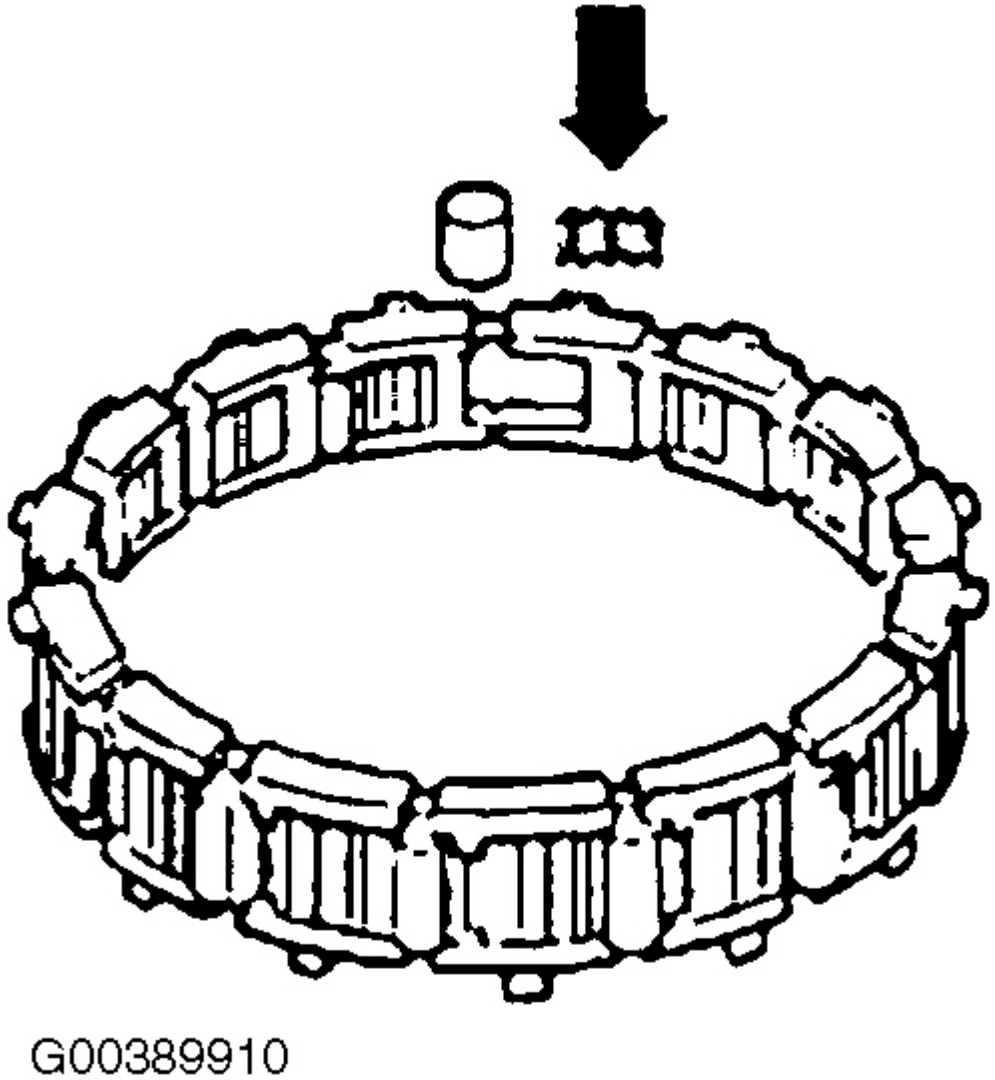


Fig. 117: Pressing On Large Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Thrust washer

- Install thrust washer before pressing on inner race. Shoulder faces inner race.

Checking synchro-ring for wear

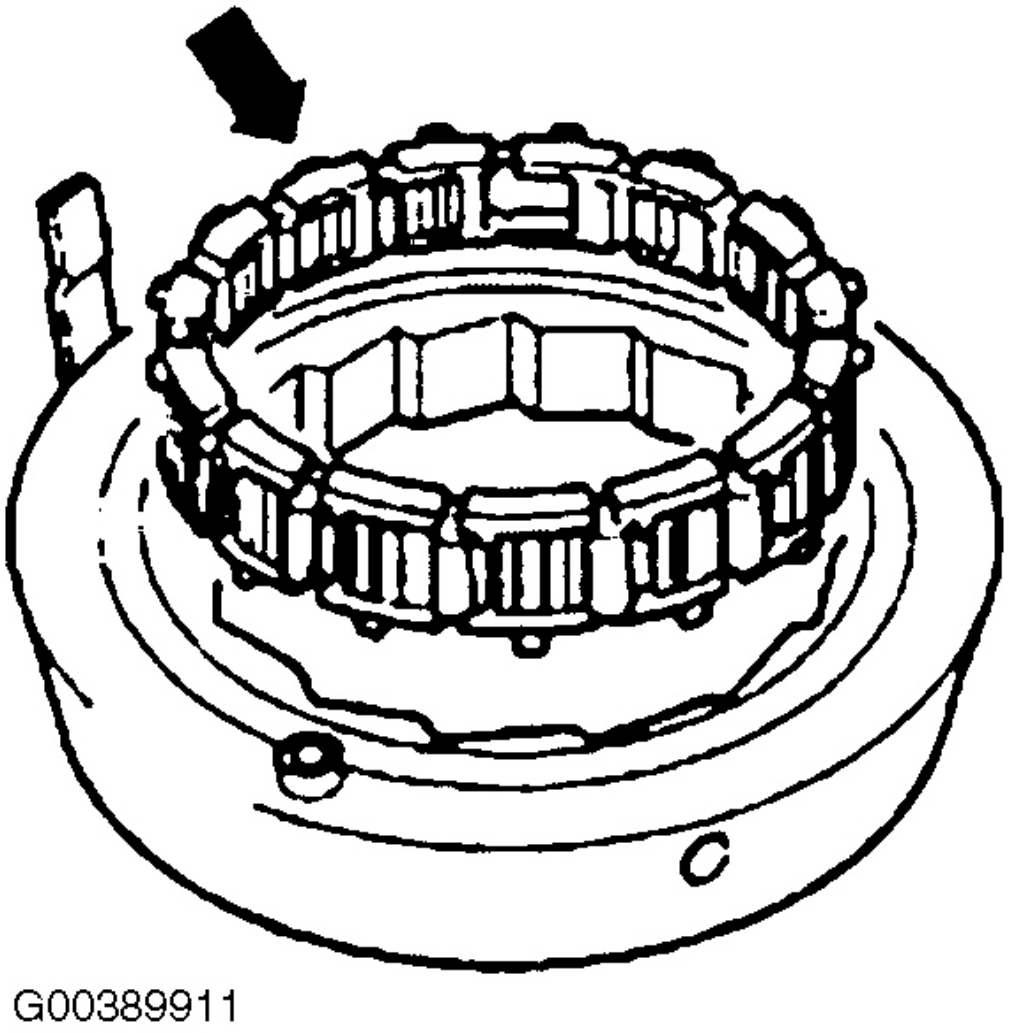


Fig. 118: Checking Synchro-Ring For Wear (Output Shaft)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

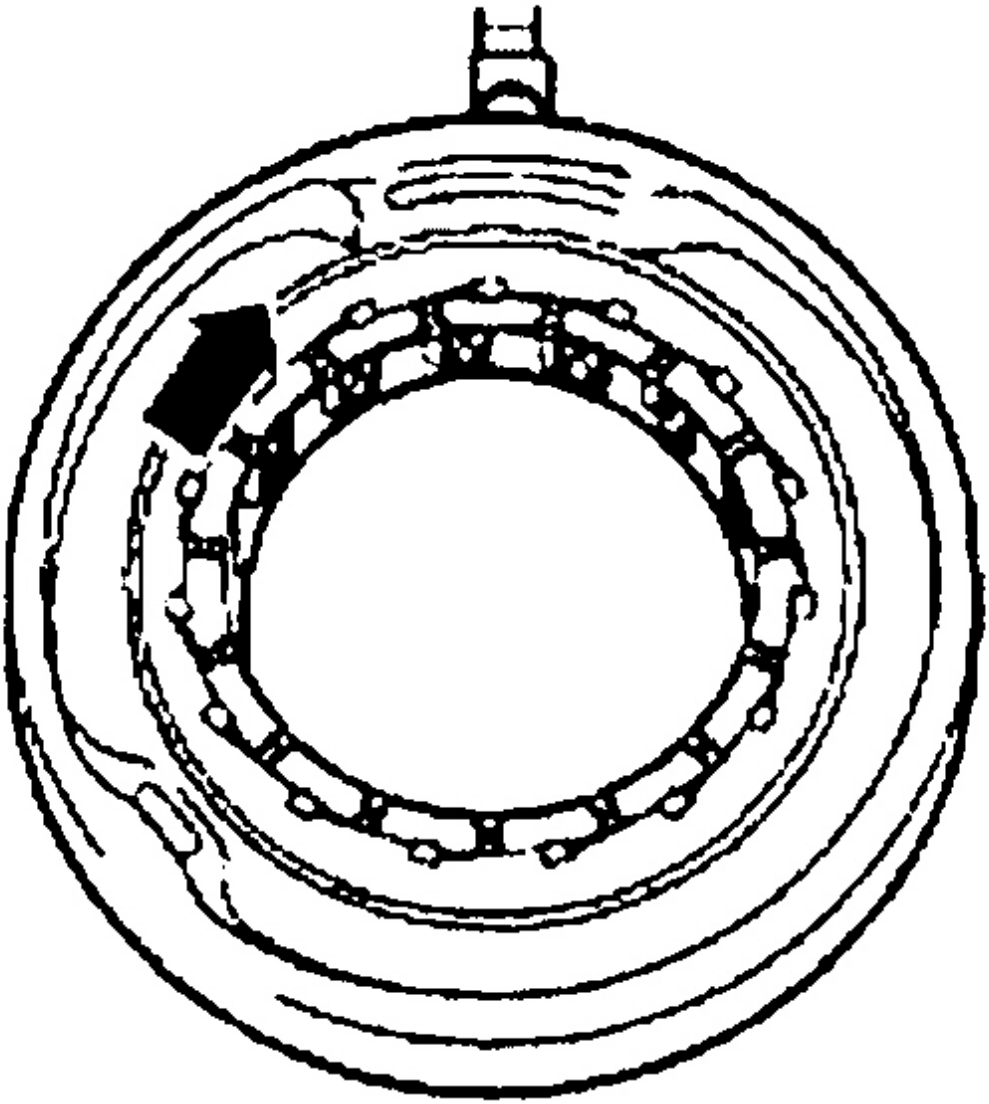
- Press synchro-ring onto gear wheel cone and measure gap "a" with feeler gauge.

SYNCHRO-RING GAP DIMENSIONS WEAR LIMIT (OUTPUT SHAFT)

Gap "a"	New dimension	Wear limit

1st gear	1.0 ... 1.7 mm	0.5 mm
3rd gear	1.0 ... 1.7 mm	
4th gear	1.0 ... 1.7 mm	

Disassembling and assembling 1st and 2nd gear locking collar and synchro-hub



G00389912

Fig. 119: Disassembling And Assembling 1st And 2nd Gear Locking Collar And Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

1. Spring
2. Locking collar
3. Synchro-hub
4. Locking piece
    - Slide locking collar over synchro-hub.

      The wide shoulder of the synchro-hub (arrow -A-) and the outer splines of the locking collar (arrow -B-) face opposite directions after assembly. Recesses for locking pieces on synchro-hub and locking collar must align.

Assembling 1st and 2nd gear locking collar/synchro-hub

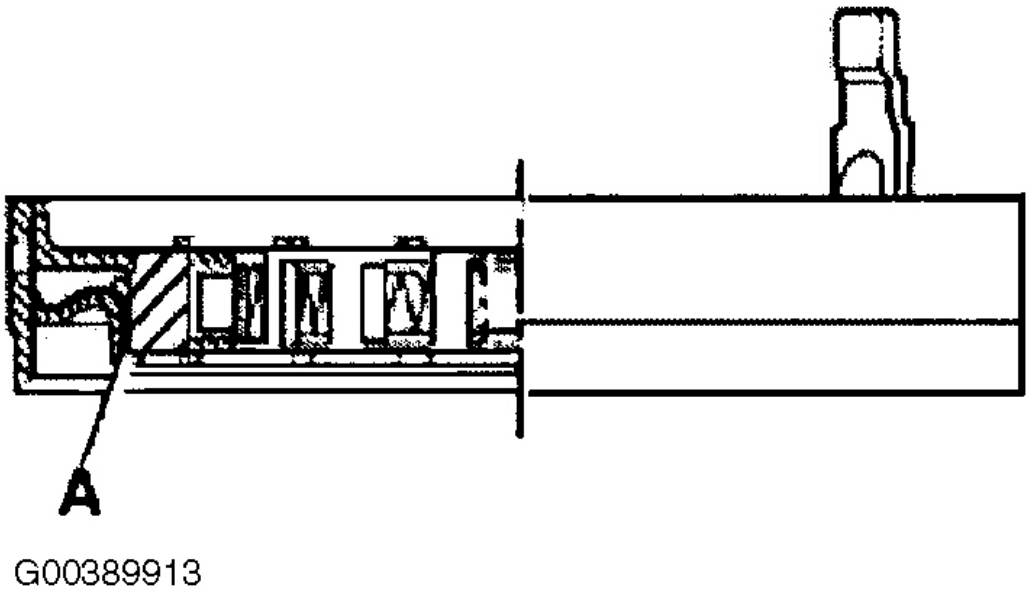


Fig. 120: Assembling 1st And 2nd Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Locking collar is pushed over synchro-hub.
    - Insert locking pieces and install springs 120° off-set. The angled end of spring must locate in hollow locking piece.

Installation position 1st and 2nd gear locking collar/synchro-hub

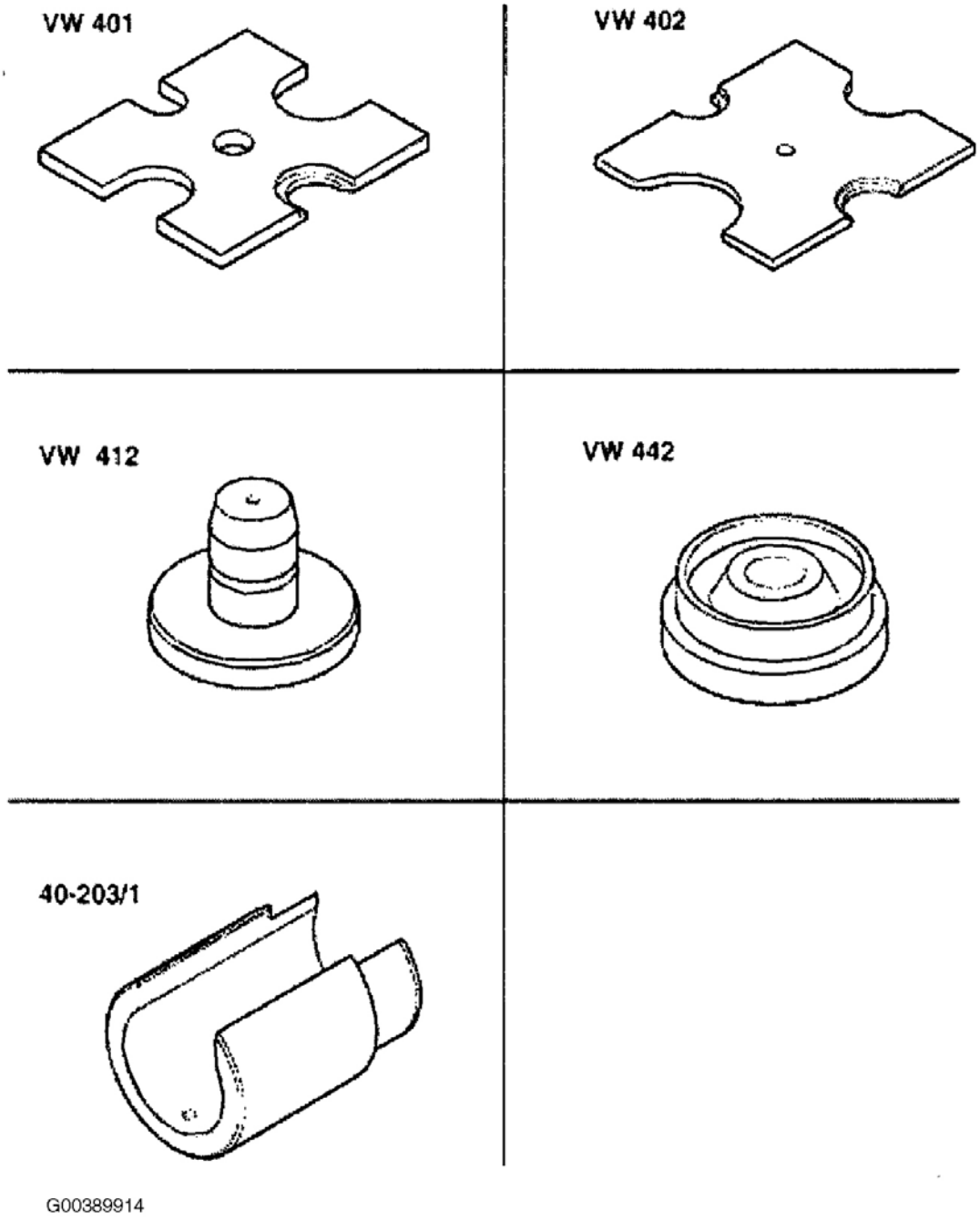
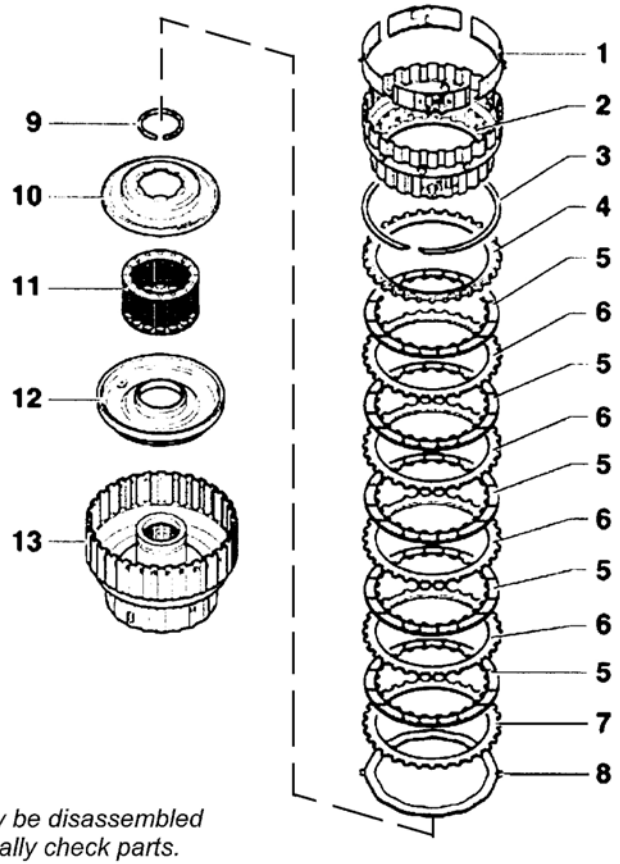


Fig. 121: Identifying Installation Position 1st And 2nd Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The locking collar splines (arrow -1-) point to splines for 3rd/4th gear synchro-hub -A-.

The wide shoulder of the synchro-hub (arrow -2-) then faces to 1st gear -B-.

Pressing on 1st and 2nd gear locking collar/synchro-hub



Note:

The clutch should only be disassembled for cleaning or to visually check parts.

The clutches -K1- and -K3- are pressed together.

1 - Supporting ring
- 4-piece, unclip from inner plate carrier

2 - Inner plate carrier

3 - Circlip
- Different thicknesses
- Mark after removing and insert in same position

4 - Thrust plate
- Smooth side faces inner plate

5 - Inner plate

6 - Outer plate
- Always 1.5 mm thick

7 - Outer plate
- Always 2 mm thick

8 - Corrugated washer

9 - Circlip

10 - Piston cap
- Sealing lips are vulcanized to cap
- Moisten sealing lips with ATF before installing
- Turn cap slightly when installing

11 - Intermediate spring ring
- With spring supporting shell and compression springs

12 - Piston
- Sealing lips are vulcanized to piston
- Moisten sealing lips with ATF before installing
- Turn piston slightly when installing

13 - Clutch housing
- Before inserting the inner plate carrier corrugated washer (item -8-), insert inner and outer plates in clutch

G00389915

Fig. 122: Pressing On 1st And 2nd Gear Locking Collar/Synchro-Hub

Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Before pressing on, place 1st gear synchro-ring on 1st gear wheel.

Identifying 1st and 2nd gear synchro-rings

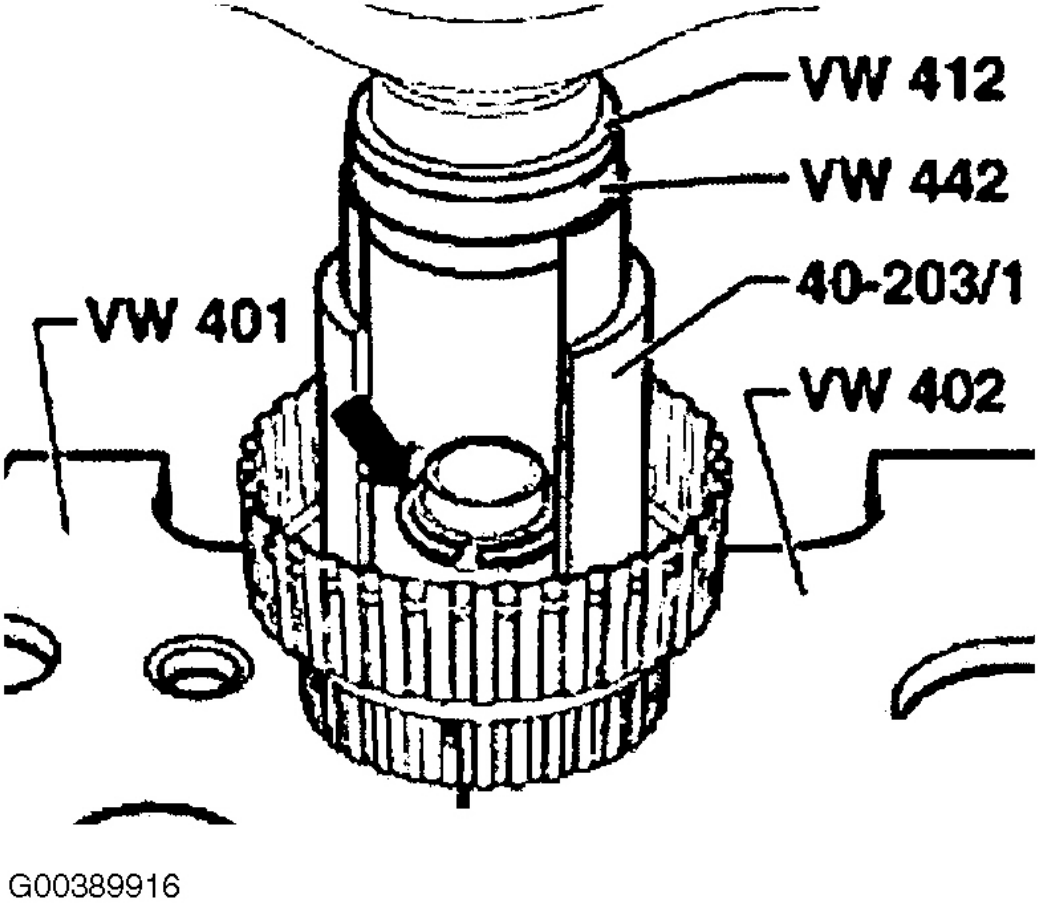


Fig. 123: Identifying 1st And 2nd Gear Synchro-Rings
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 1st gear synchro-ring: 3 x 1/2 ground-down half teeth (arrow)
- 2nd gear synchro-ring: 3x1/2 ground down half teeth (arrow) or 2 ground-down half teeth

  Only the version with 2x1/2 ground-down half teeth is available as a spare part for the 2nd gear synchro-ring.

Distinguishing 1st and 2nd gear synchro-rings

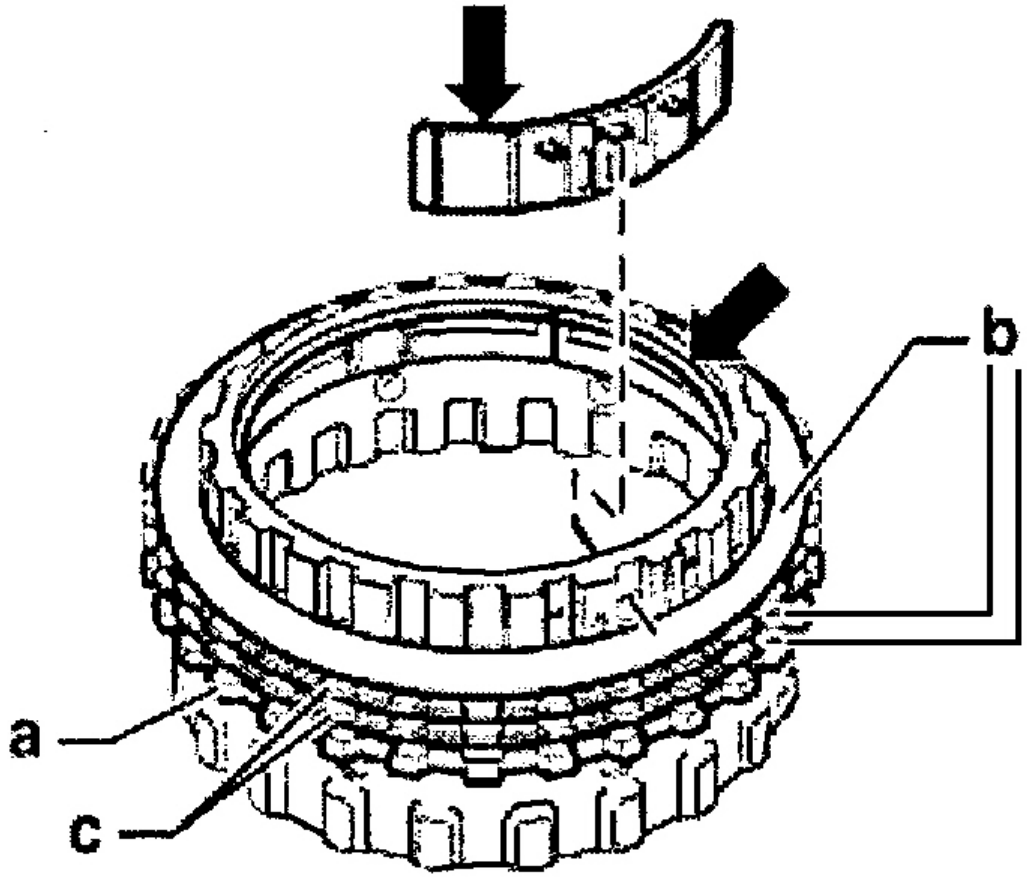


Fig. 124: Distinguishing 1st And 2nd Gear Synchro-Rings
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 1st gear synchro-ring - no recesses
- 2nd gear synchro-ring - three recesses (arrows)

Checking 2nd gear synchro-ring for wear

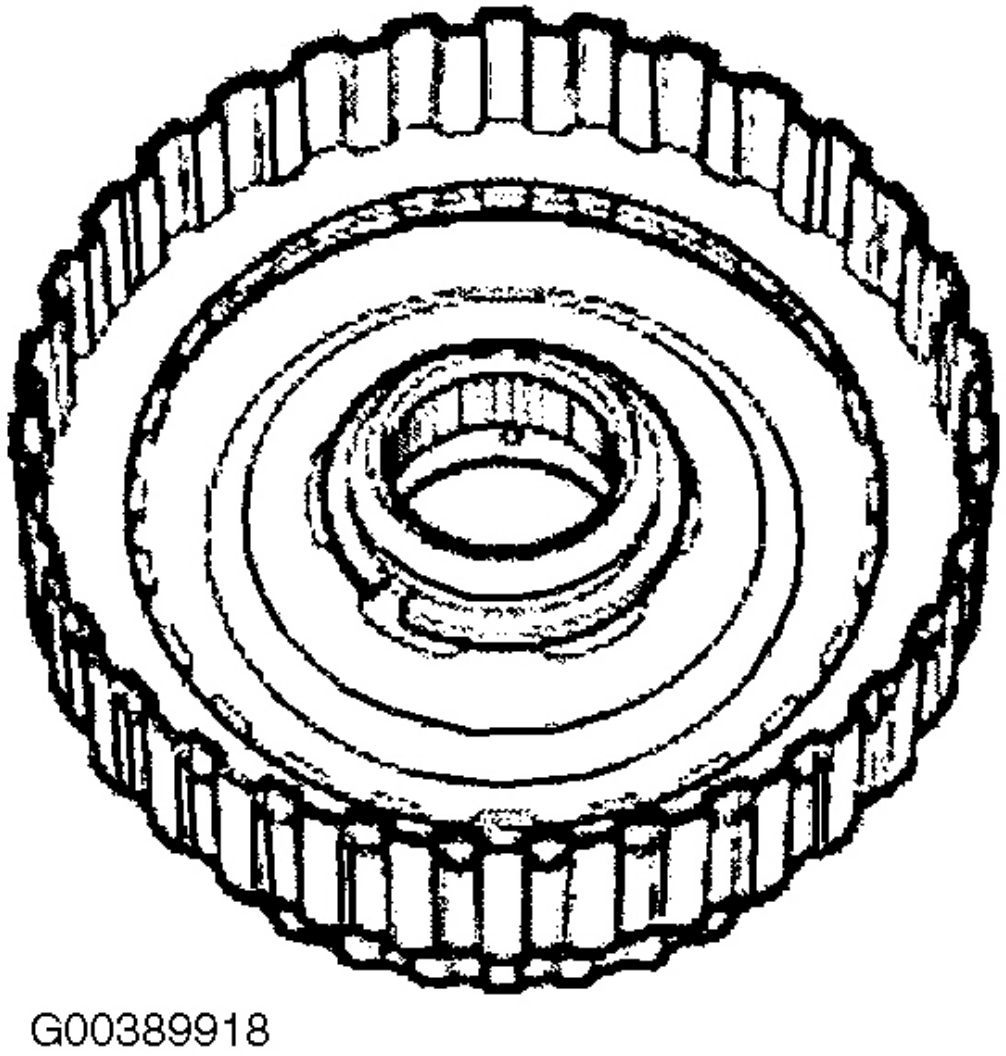


Fig. 125: Checking 2nd Gear Synchro-Ring For Wear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press synchro-ring, outer-ring and inner-ring onto gear wheel cone and measure gap "a" with feeler gauge.

2ND GEAR SYNCHRO-RING GAP DIMENSIONS WEAR LIMIT

Gap "a"	New dimension	Wear limit
2nd gear	1.2 ... 1.8 mm	0.5 mm

Installation position outer-ring

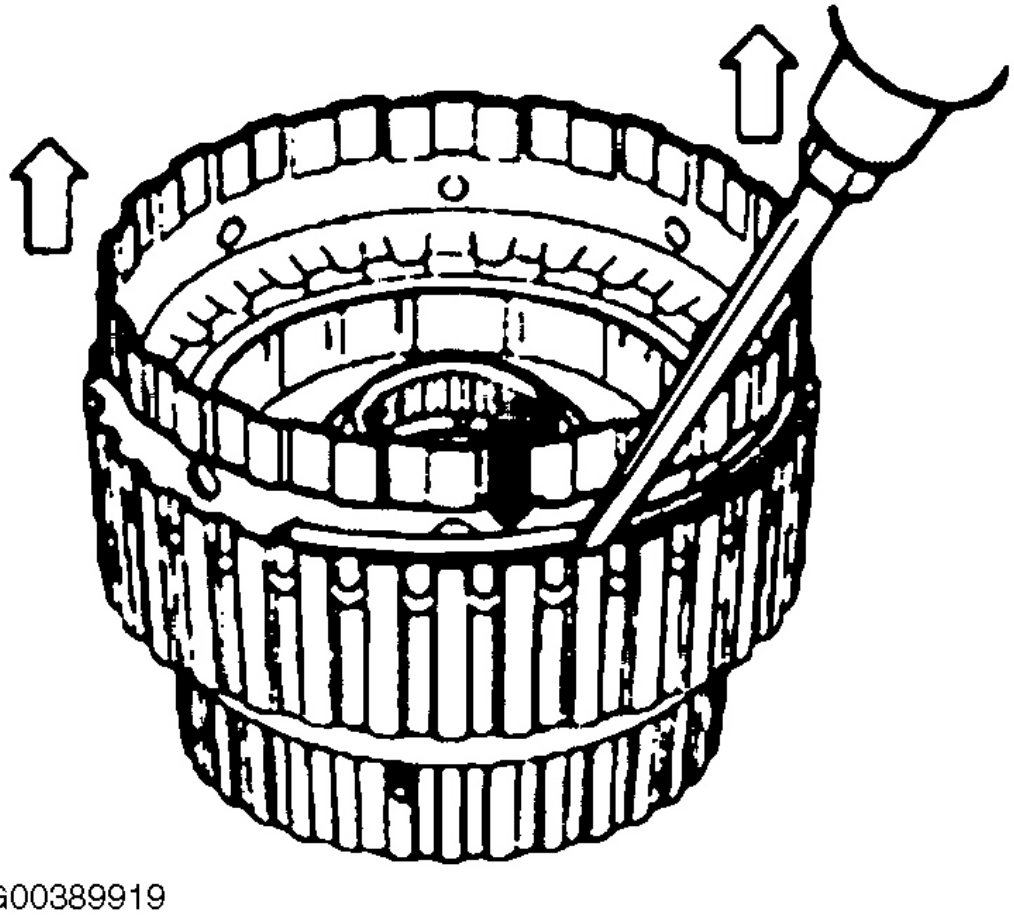


Fig. 126: Installation position outer-ring
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The lugs (arrows) face to 1st gear -A-

Checking inner ring for wear

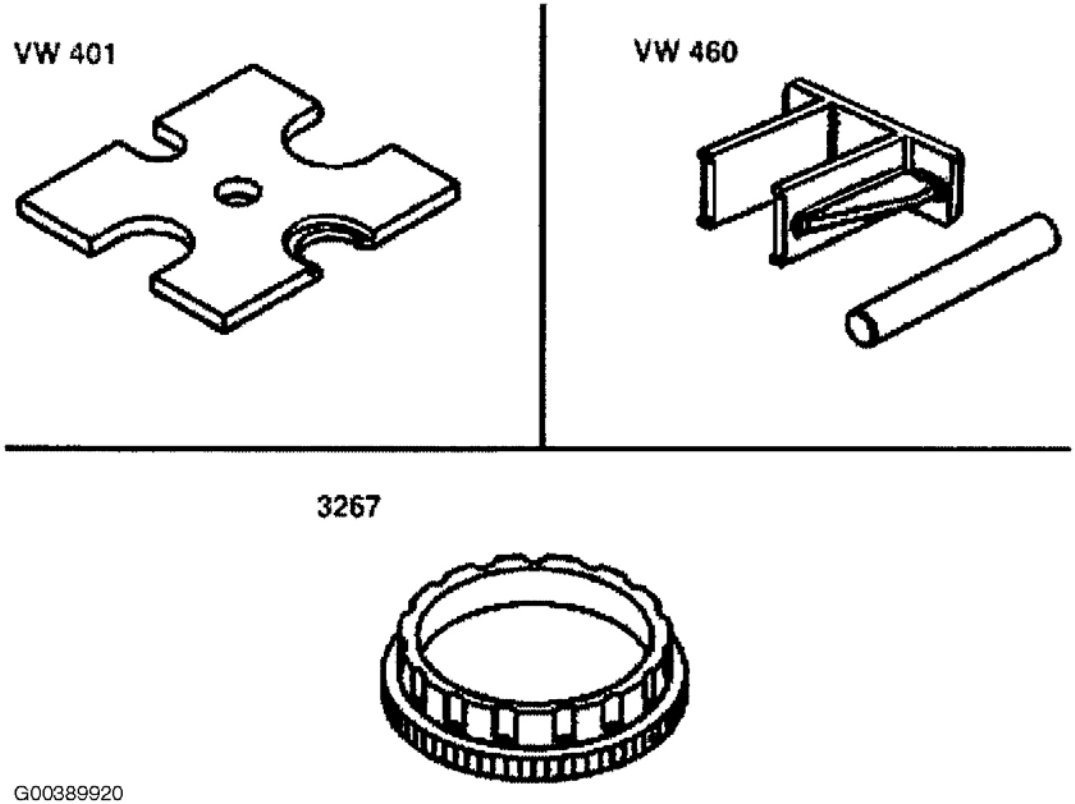


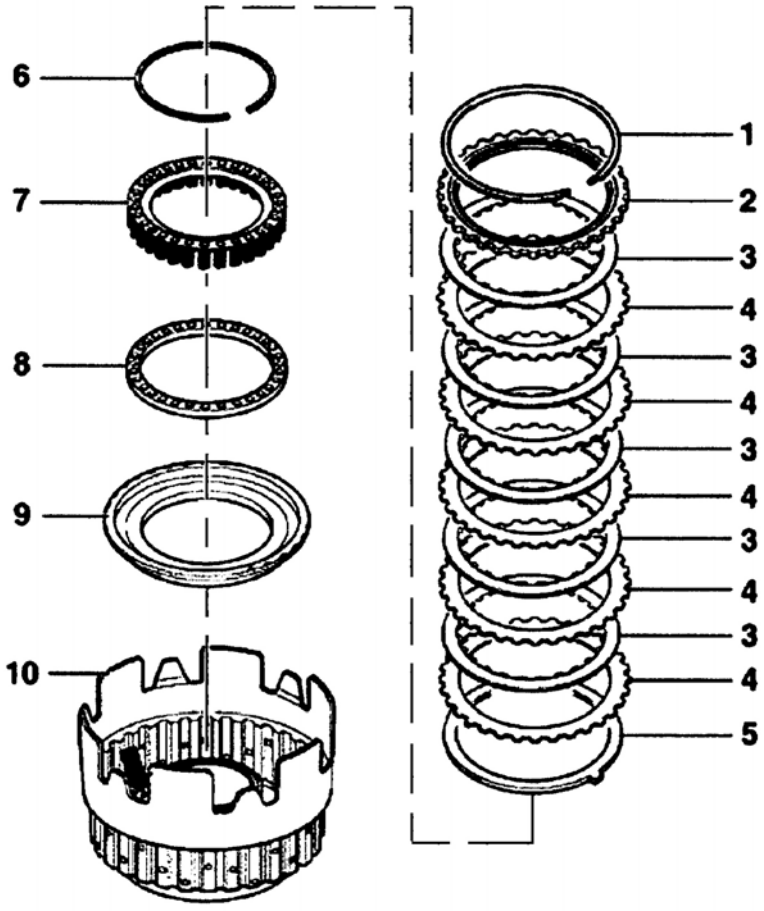
Fig. 127: Checking 2nd Gear Synchro-Ring Inner Ring For Wear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press inner ring onto 2nd gear wheel cone and measure gap "a" with a feeler gauge.

2ND GEAR SYNCHRO INNER RING GAP DIMENSIONS WEAR LIMIT

Gap "a"	New dimension	Wear limit
2nd gear	0.75 ... 1.25 mm	0.3 mm

Installation position synchro-ring (inner-ring)



Note:

- *The clutch should only be disassembled for cleaning or to visually check parts.*
- *When doing this ensure that the ball valve (arrow) is not damaged.*

1 - Circlip
- Mark after removing and insert in same position

2 - Thrust plate
- Smooth side facing inner plates

3 - Inner plate

4 - Outer plate

5 - Corrugated washer

6 - Circlip

7 - Spring supporting plate
- With springs

8 - Spring supporting ring

9 - Piston
- Sealing lips are vulcanized to piston
- Moisten sealing lips with ATF before installing
- Turn piston slightly when installing

10 - Clutch housing

G00389921

Fig. 128: Identifying Installation Position Synchro-Ring (Inner-Ring)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The lugs (arrow -1-) locate in the recesses (arrow -2-) in the synchro-ring -B-.

Installation position 2nd gear wheel

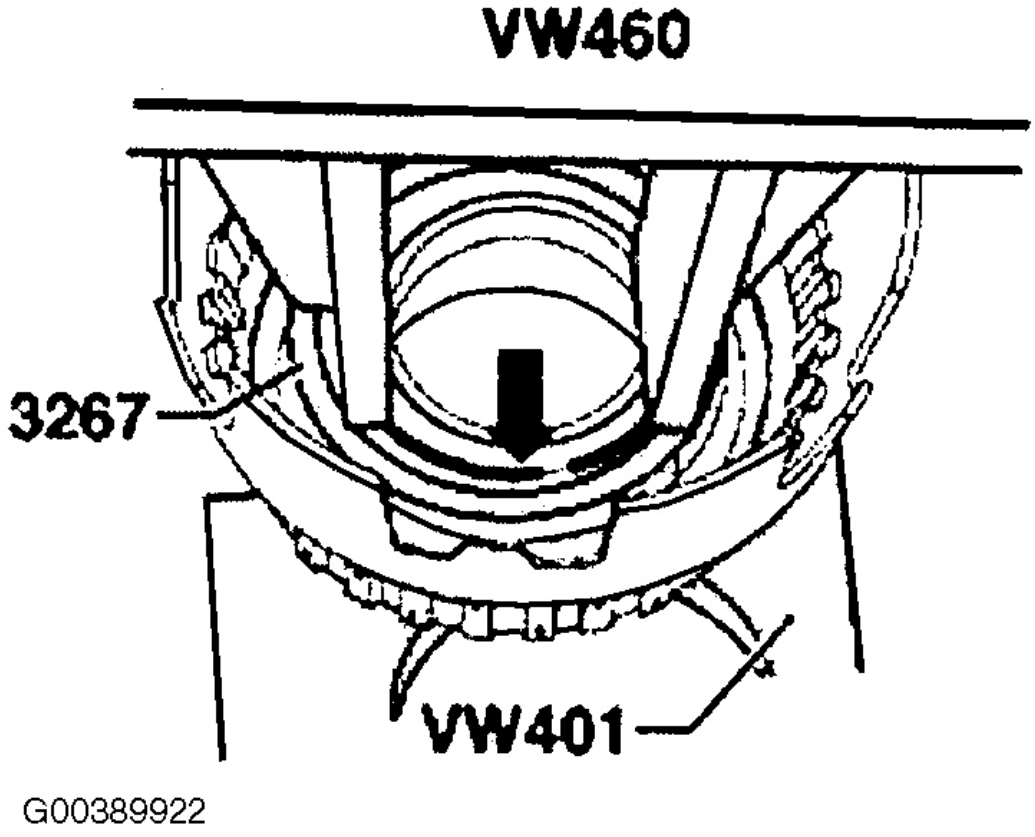
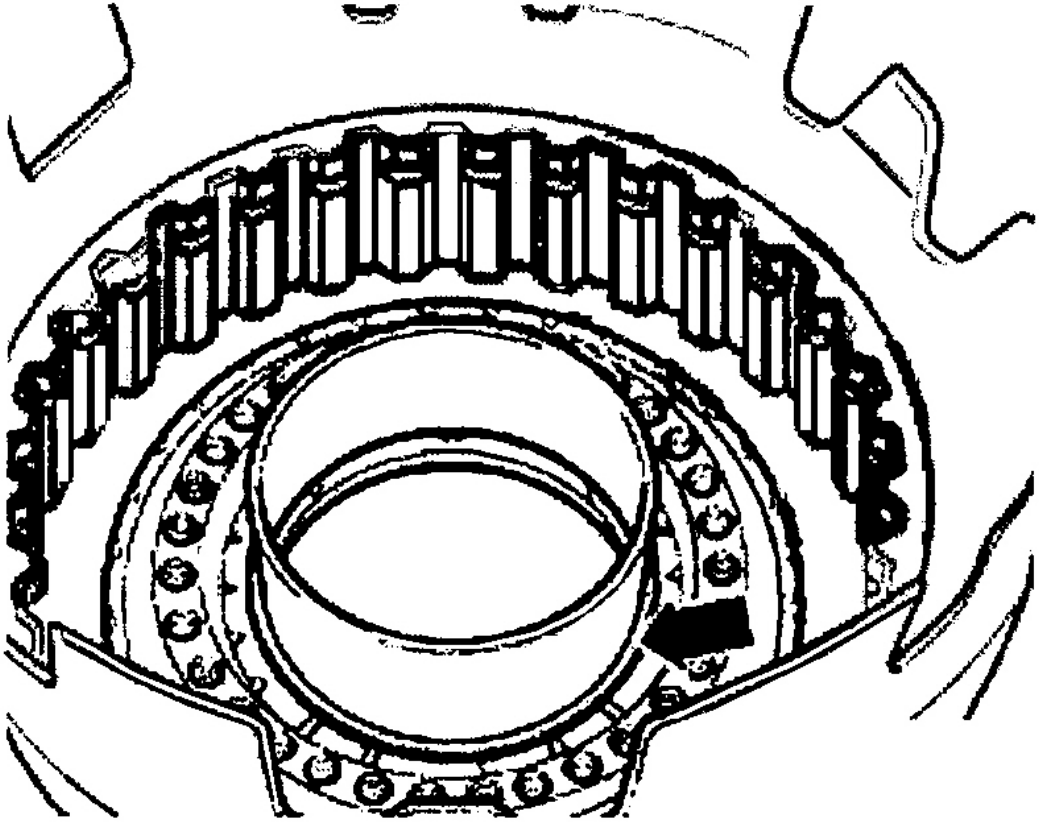


Fig. 129: Identifying Installation Position 2nd Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The higher shoulder -A- faces to 1st gear -B-. The recesses in the shoulder (arrows) locate with the lugs of the outer-ring (arrow. See **Installation position outer-ring**)

Pressing on needle roller bearing sleeve for 3rd gear



G00389923

Fig. 130: Pressing On Needle Roller Bearing Sleeve For 3rd Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Disassembling and assembling 3rd and 4th gear locking collar and synchro-hub

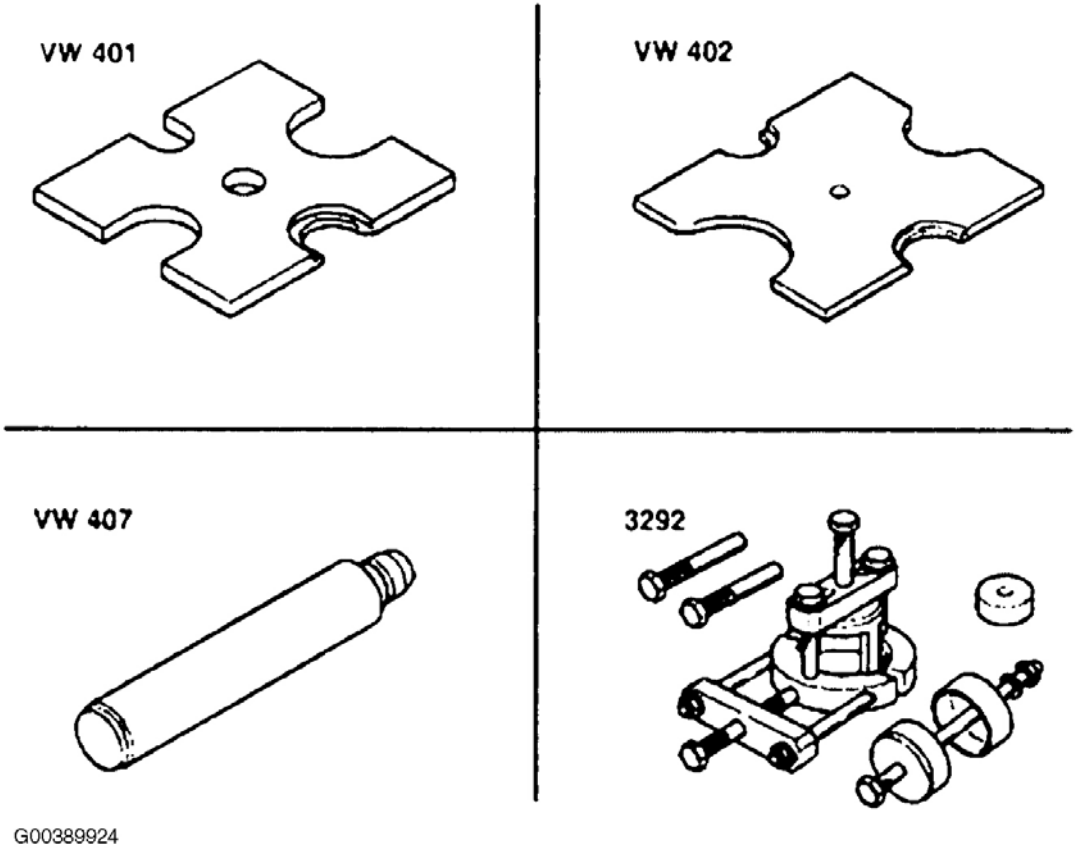
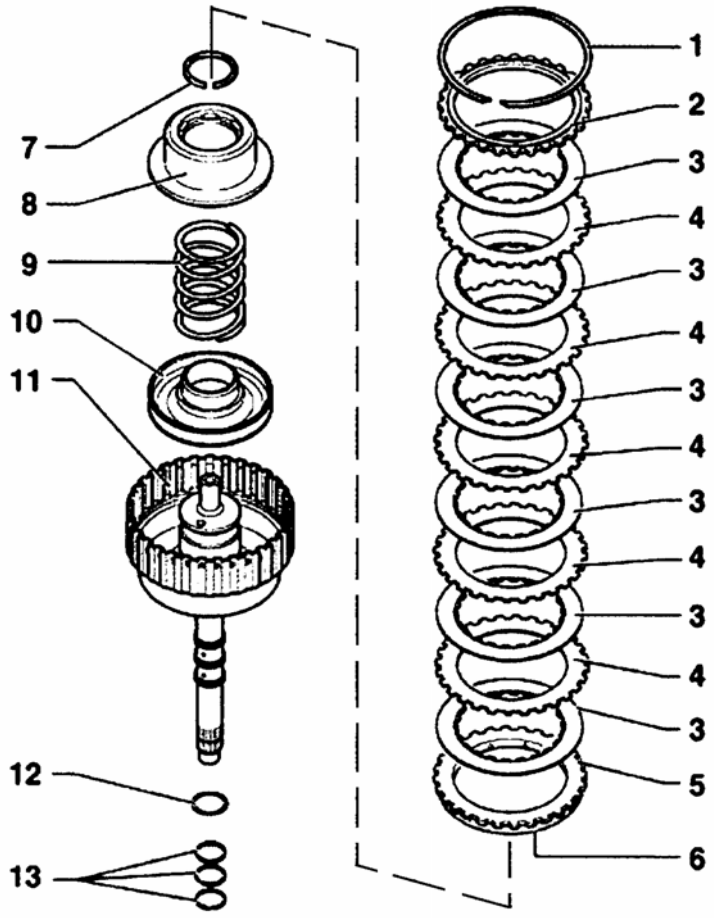


Fig. 131: Disassembling And Assembling 3rd And 4th Gear Locking Collar And Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

1. Spring
2. Locking piece
3. Locking collar
4. Synchro-hub
    - Slide locking collar over synchro-hub.

The recesses for locking pieces in synchro-hub and locking collar must align.

Assembling 3rd and 4th gear locking collar/synchro-hub



Note:

The clutch should only be disassembled for cleaning or to visually check parts.

The clutches -K1- and -K3- are pressed together.

1 - Circlip
- Different thickness
- Mark after removing and insert at same point

2 - Thrust plate
- Install with stepped side facing circlip

3 - Inner plate

4 - Outer plate

5 - Pressure plate
- Install with peened corrugated washer facing piston

6 - Corrugated washer
- Peened to pressure plate (item - 5 -)

7 - Securing ring

8 - Piston cap
- Sealing lips are vulcanized to piston cap
- Moisten with ATF before installing
- Turn piston cap slightly when installing
- When removing and installing press down and fit securing ring (item - 7 -)

9 - Spring
- Seat between piston and piston cap

10 - Piston
- Sealing lips are vulcanized to piston
- Moisten with ATF before installing
- Turn piston slightly when installing

11 - Clutch housing with turbine shaft
- Height varies according to number of inner and outer plates

12 - O-ring
- Always replace

13 - Piston ring

G00389925

Fig. 132: Assembling 3rd And 4th Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The locking collar has been pushed over the synchro-hub.

If the locking pieces are inner hollow

- Insert locking pieces and install springs 120° off-set. Angled end of spring must locate in hollow locking piece.

If the locking pieces are not inner hollow

- Insert locking pieces and install springs 120° off-set. The spring must locate with the angled ends of the locking pieces.

Installation position 3rd and 4th gear locking collar/synchro-hub

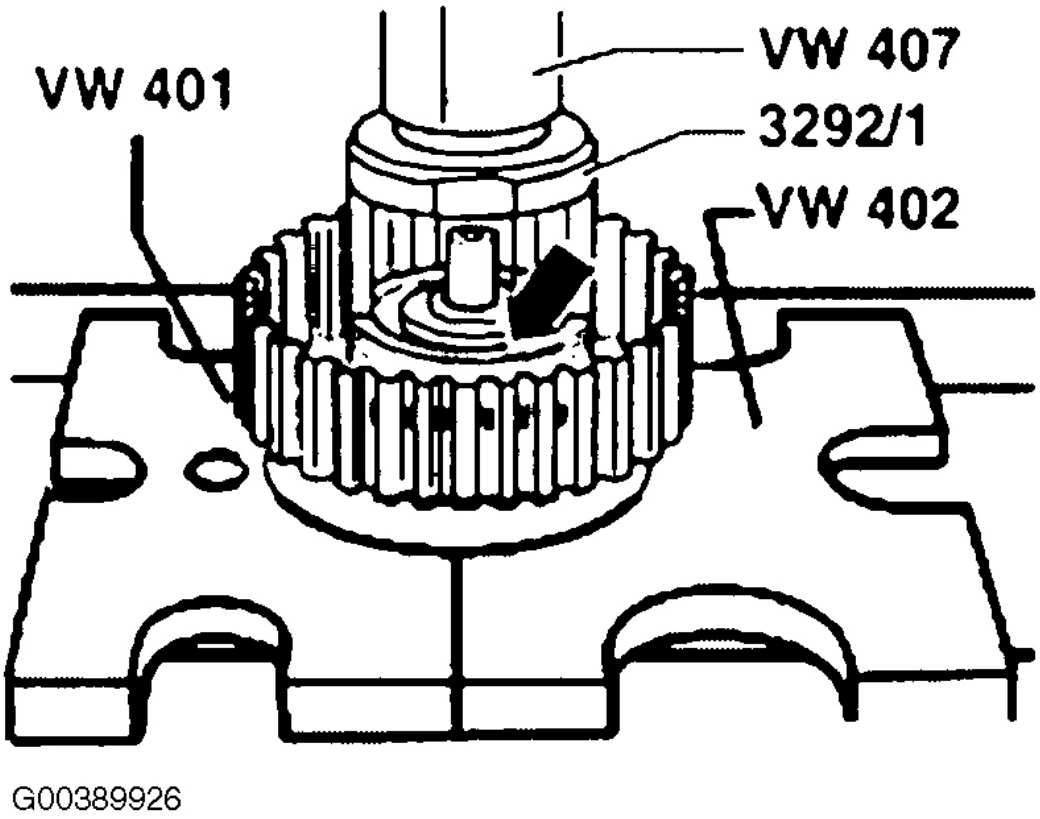


Fig. 133: Identifying Installation Position 3rd And 4th Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Chamfer (arrow) faces to 4th gear.

Pressing on 3rd and 4th gear synchro-hub with locking collar

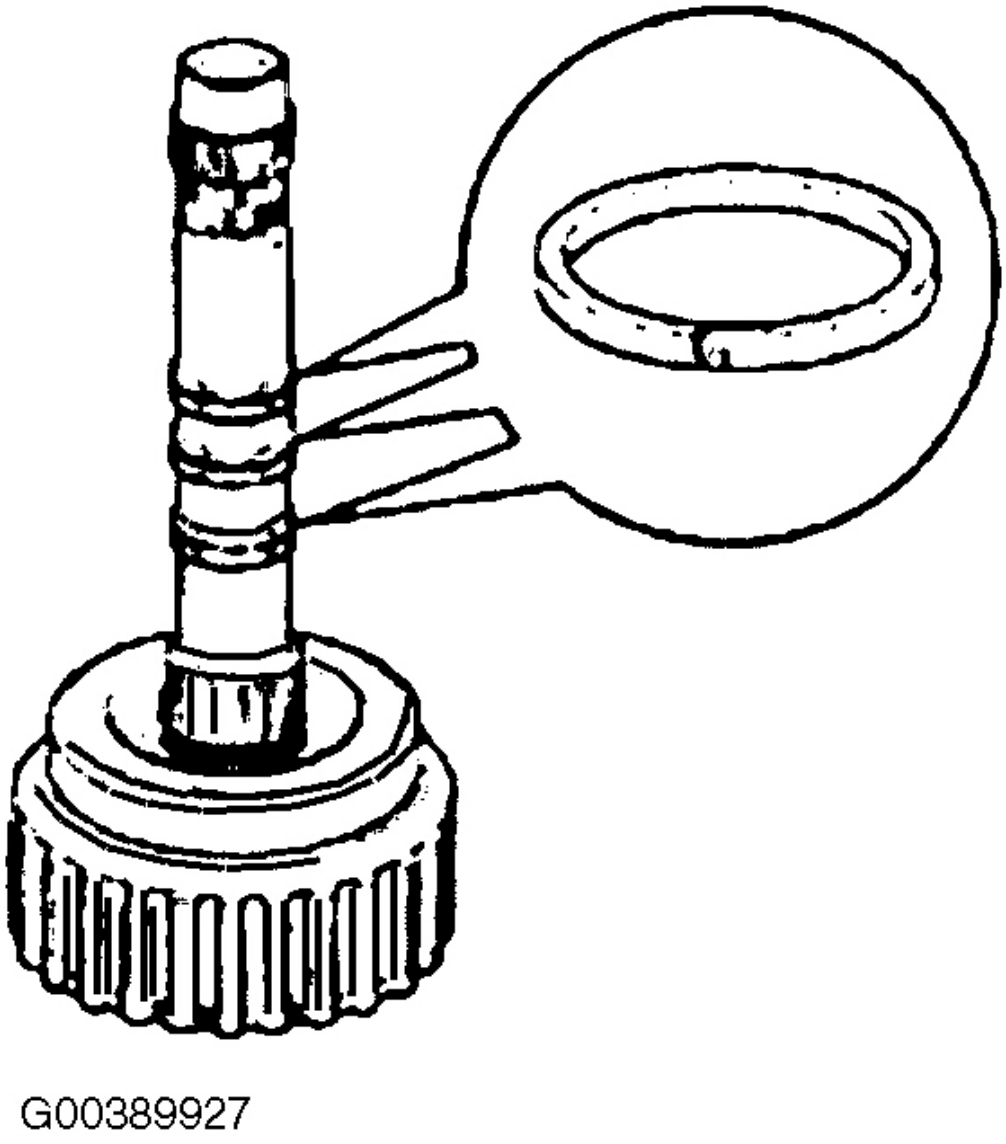


Fig. 134: Pressing On 3rd And 4th Gear Synchro-Hub With Locking Collar
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing on sleeve for 4th gear needle roller bearing

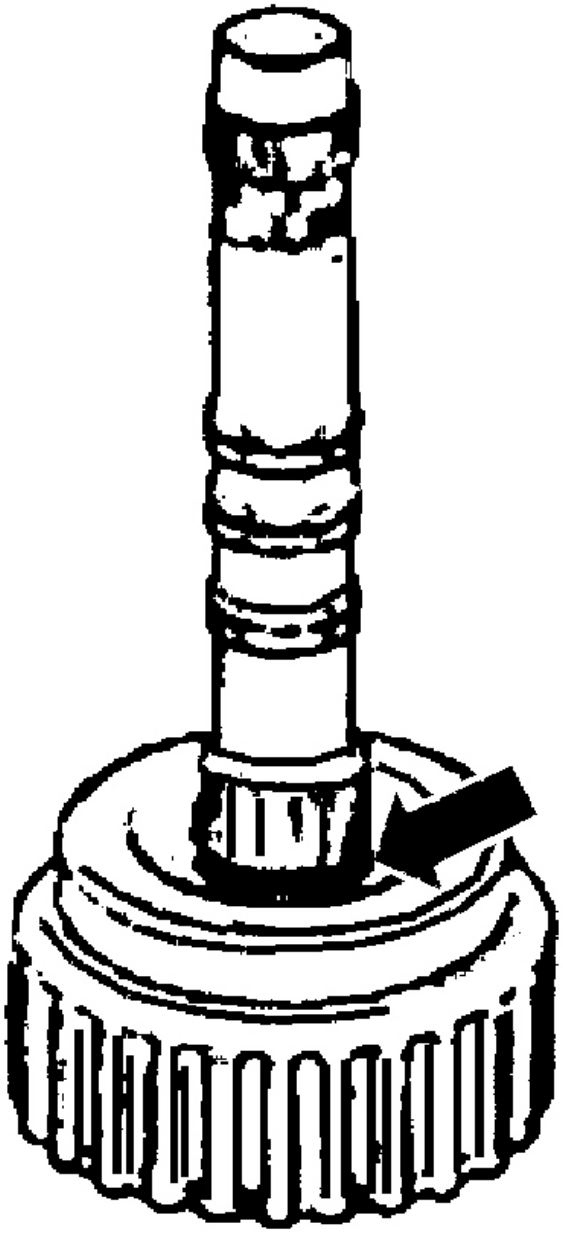
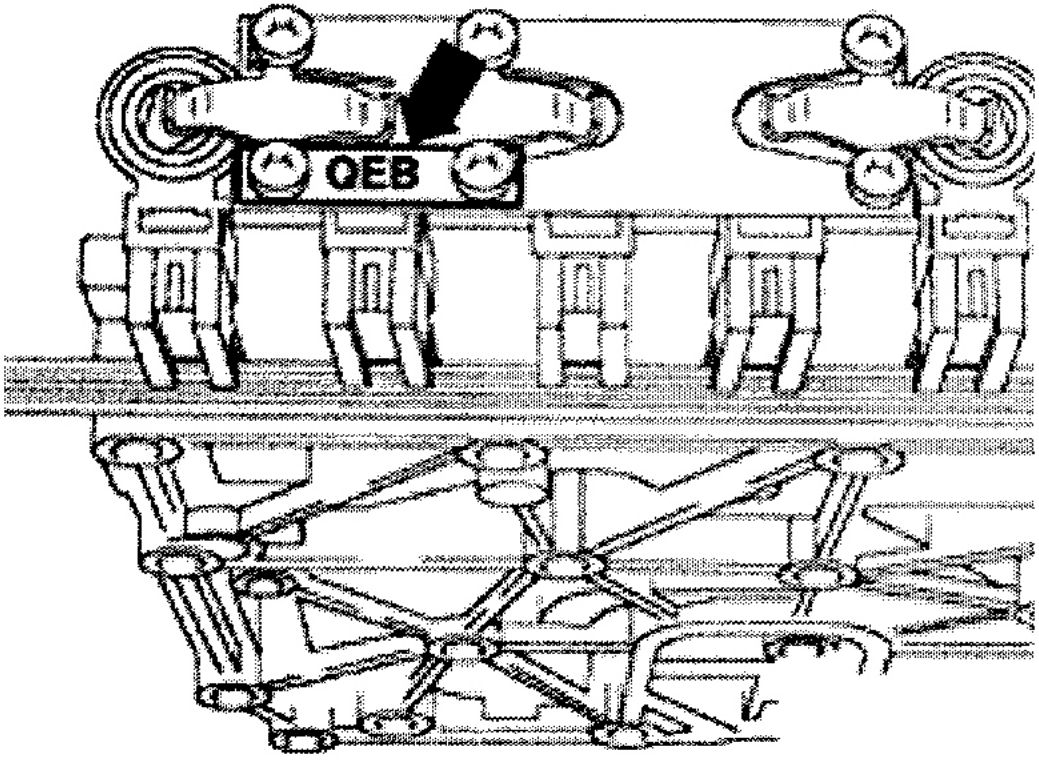


Fig. 135: Pressing On Sleeve For 4th Gear Needle Roller Bearing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

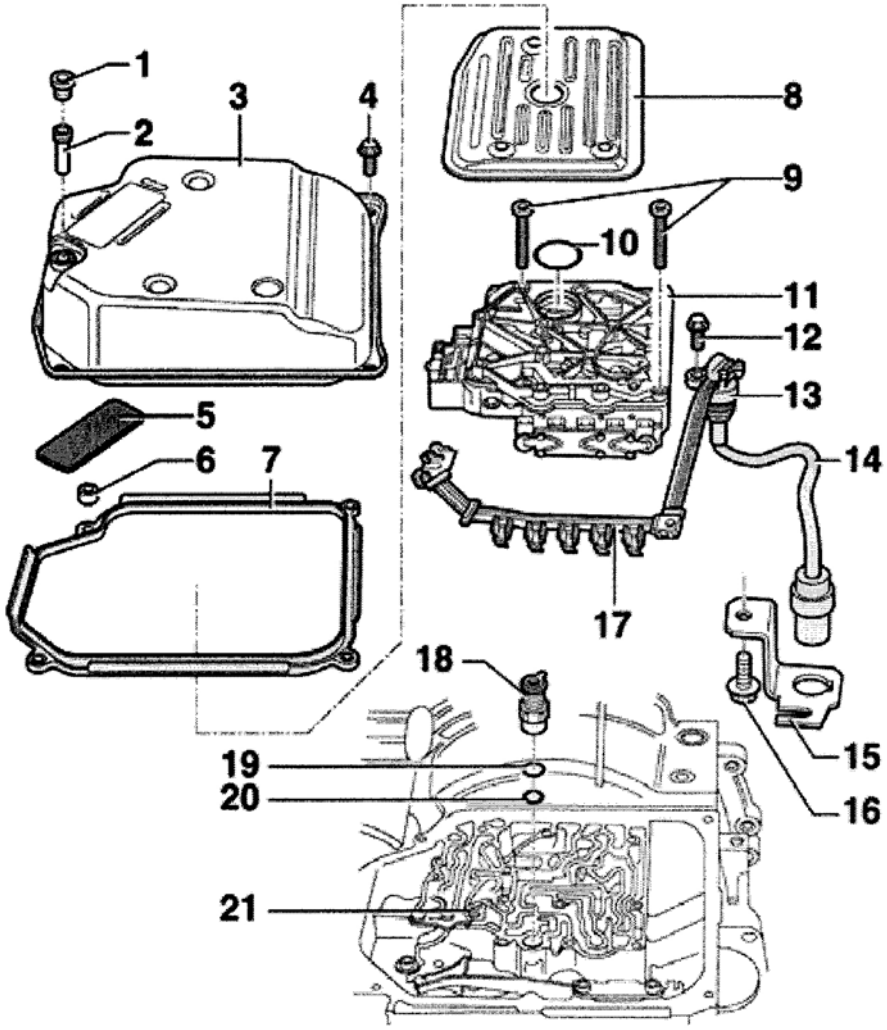
Pressing on sleeve for output shaft needle roller bearing



G00382794

Fig. 136: Pressing On Sleeve For Output Shaft Needle Roller Bearing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Synchronizer for 1st gear has been modified, from transmission build date 02 05 0



1. ATF Level Plug
2. Overflow Pipe
3. Transmission Oil Pan
4. Oil Pan Bolt
5. Magnet
6. Spacer Bushing
7. Oil Pan Gasket
8. ATF Filter
9. Valve Body Bolt
10. Valve Body Gasket
11. Valve Body
12. Conductor Strip Bolt
13. O-Ring
14. Conductor Strip
15. Retaining Bracket
16. Retaining Bracket Bolt
17. Solenoid Valves Plug
18. Sealing Plug
19. O-Ring
20. O-Ring
21. Manual Selector Valve Operating Rod

G00382787

Fig. 137: Pressing On Sleeve For Output Shaft Needle Roller Bearing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The following components have been added or modified:

- A- Inner ring
- B- Outer ring
- C- Synchro-ring

  with additional recesses -4- for the lugs -1- of inner ring -A-.

- 1st gear wheel

with additional recesses -3- for the lugs -2- of outer ring -B-.

NOTE: For the 2nd gear the same inner ring, outer ring and synchro ring are installed.

- *If the components should not be replaced, ensure they are reallocated to the original gear .*

Installation position of inner ring, outer ring and synchro-ring 1st gear:

- Place inner ring -A- on 1st gear wheel.

  Angled lugs (arrow 1) point toward outer ring -B-.

- Install outer ring -B-.

  Lugs (arrow 2) engage in gear wheel recesses (arrow 3).

- Install synchro-ring -C-.

  The recesses (arrow 4) engage in lugs (arrow 1) of inner ring -A-.

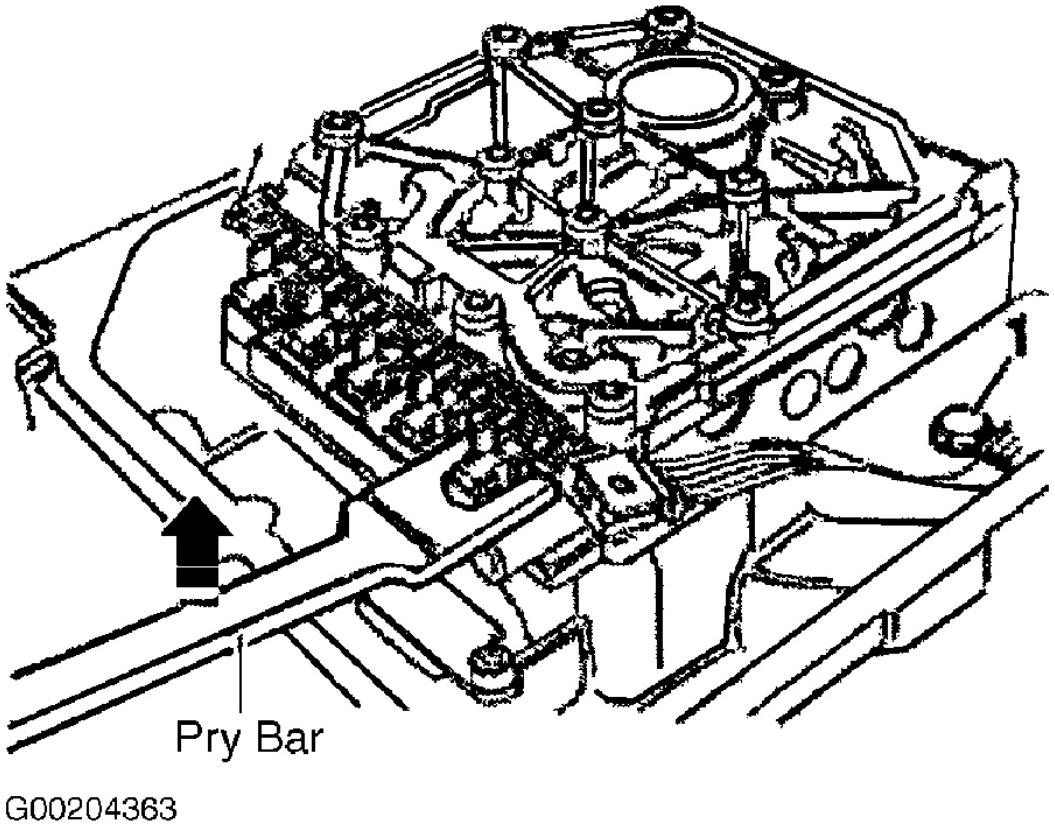


Fig. 138: Identifying Installation Position Of Inner Ring, Outer Ring And Synchro-Ring 1st Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Check inner ring 1st gear for wear

- Press inner ring onto gear wheel cone and measure gap "a" with a feeler gauge.

INNER RING 1ST GEAR GAP DIMENSIONS WEAR LIMIT

Gap "a"	New dimension	Wear limit
1st gear	0.75 ... 1.25 mm	0.3 mm

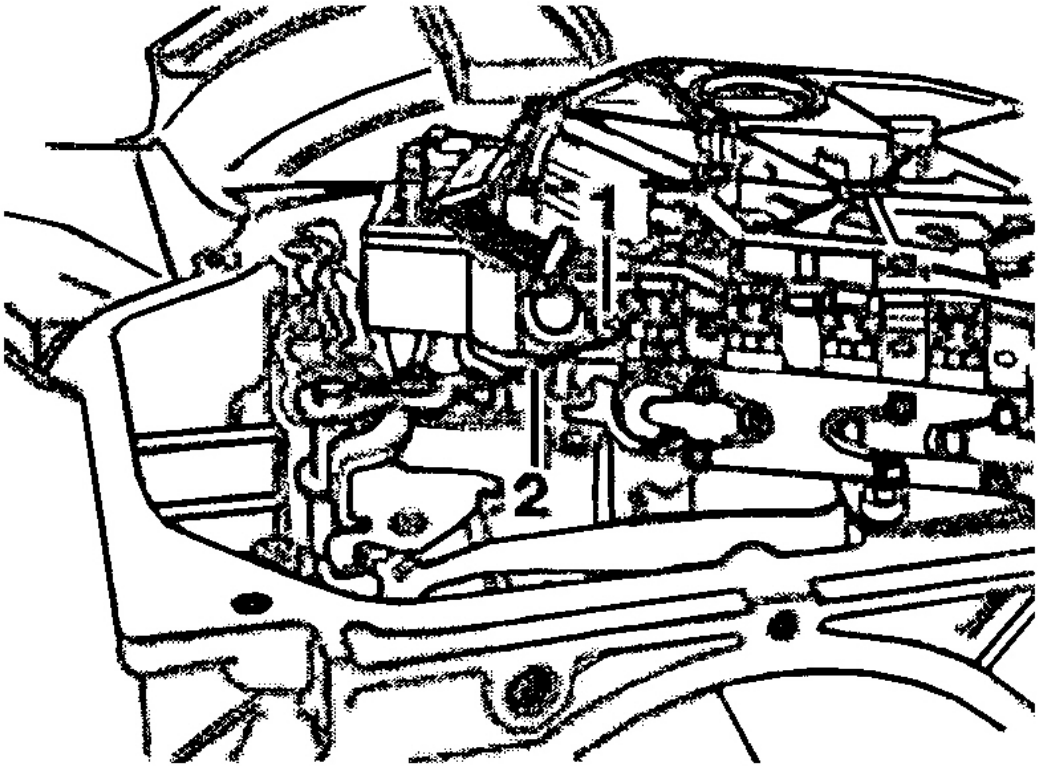


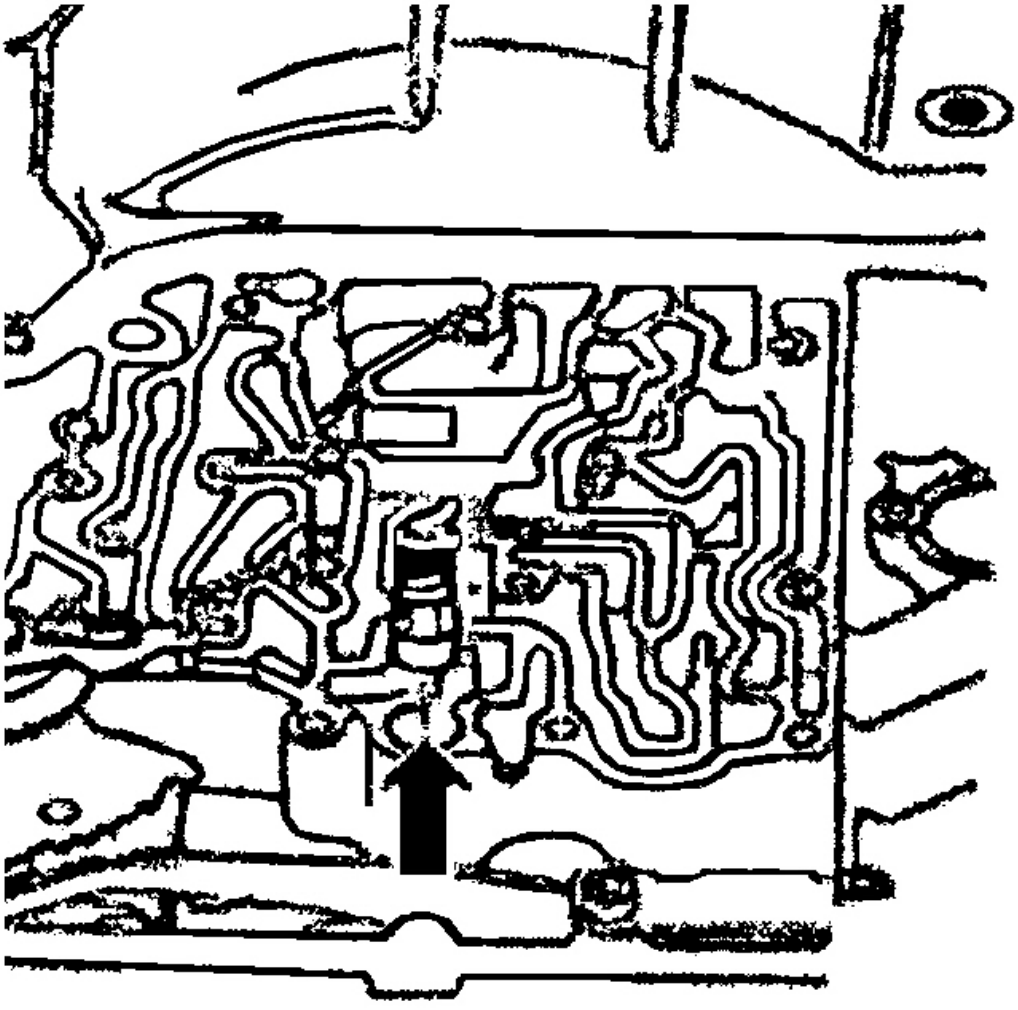
Fig. 139: Checking Inner Ring 1st Gear For Wear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Check synchro-ring 1st gear and outer ring for wear

- Press synchro-ring, outer-ring and inner-ring onto selector gear cone and measure gap "a" with feeler gauge.

SYNCHRO-RING 1ST GEAR AND OUTER RING GAP DIMENSIONS WEAR LIMIT

Gap "a"	New dimension	Wear limit
1st gear	1.2 ... 1.8 mm	0.5 mm



G00204366

Fig. 140: Checking Synchro-Ring 1st Gear And Outer Ring For Wear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Assembling locking collar and locking pieces with 1st and 2nd gear synchro-hub

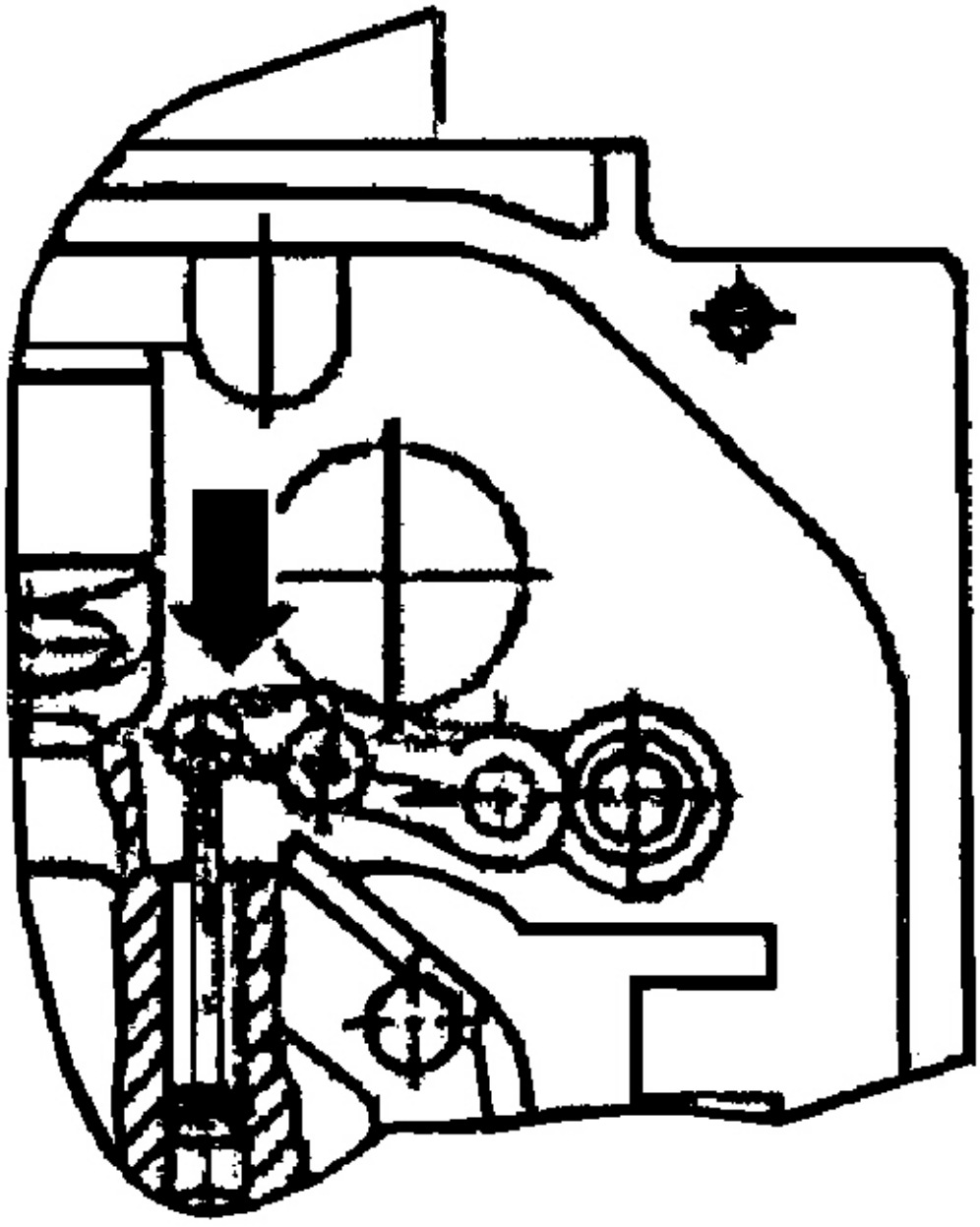


Fig. 141: Assembling Locking Collar And Locking Pieces With 1st And 2nd Gear Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

With introduction of the modified 1st gear synchronizer the shoulder has the same width on both sides of synchro-hub.

The shoulder has a chamfer on one side (arrow B).

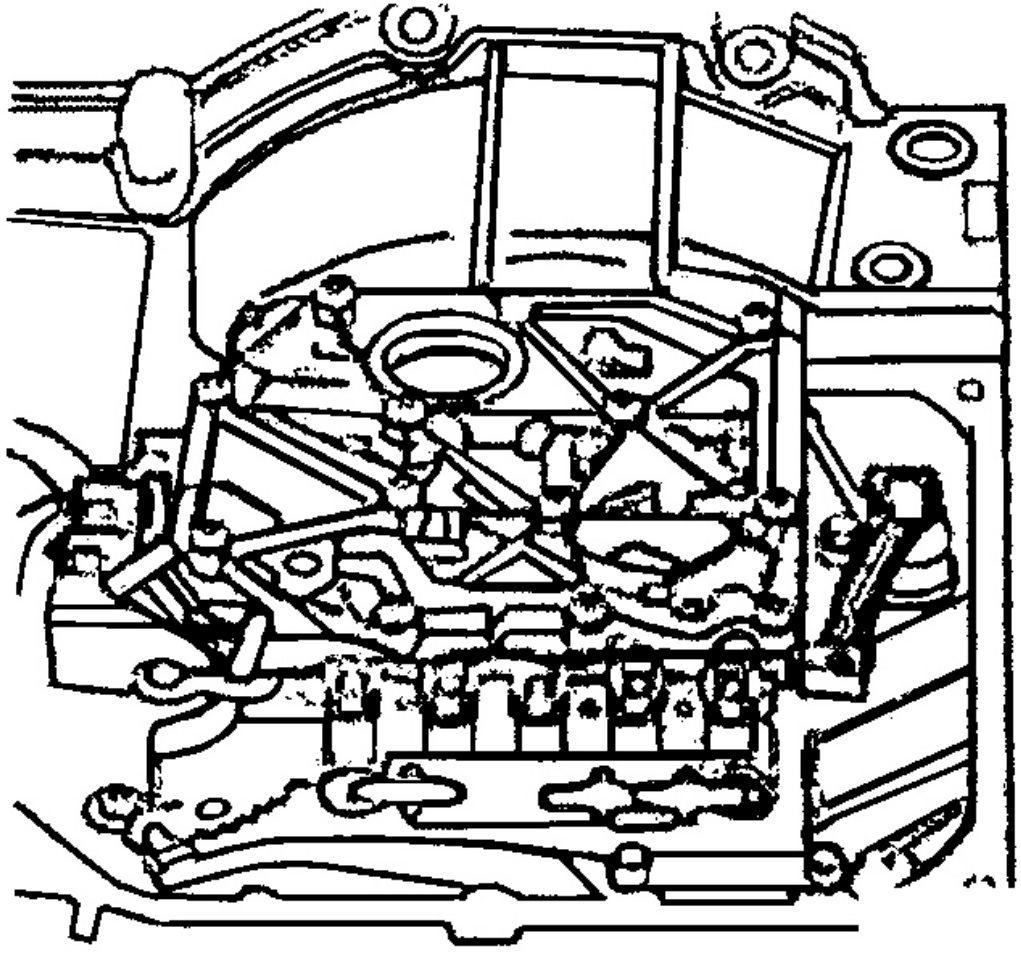
After assembly the shoulder of the synchro-hub and the outer splines of the locking collar (arrow A) face same direction.

Recesses for locking pieces on synchro-hub and locking collar (arrow C) must align one over another.

Installation position of locking collar/synchro-hub 1st and 2nd gear

The locking collar splines (arrow) point to splines for 3rd/4th gear synchro-hub -A-.

- Remove the 1st gear synchro-hub as described and install again.



G00204384

Fig. 142: Identifying Installation Position Of Locking Collar/Synchro-Hub 1st And 2nd Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

OUTPUT SHAFT, ADJUSTING

(Determining shim for output shaft)

Special tools and equipment

- VW 387 Universal dial gauge bracket
- VW 385/17 End measuring plate

- VW512 Press disk3114/2 Straightening tool
- VW 407 Press tool
- V.A.G1331 Torque wrench
- Measuring dial gauge

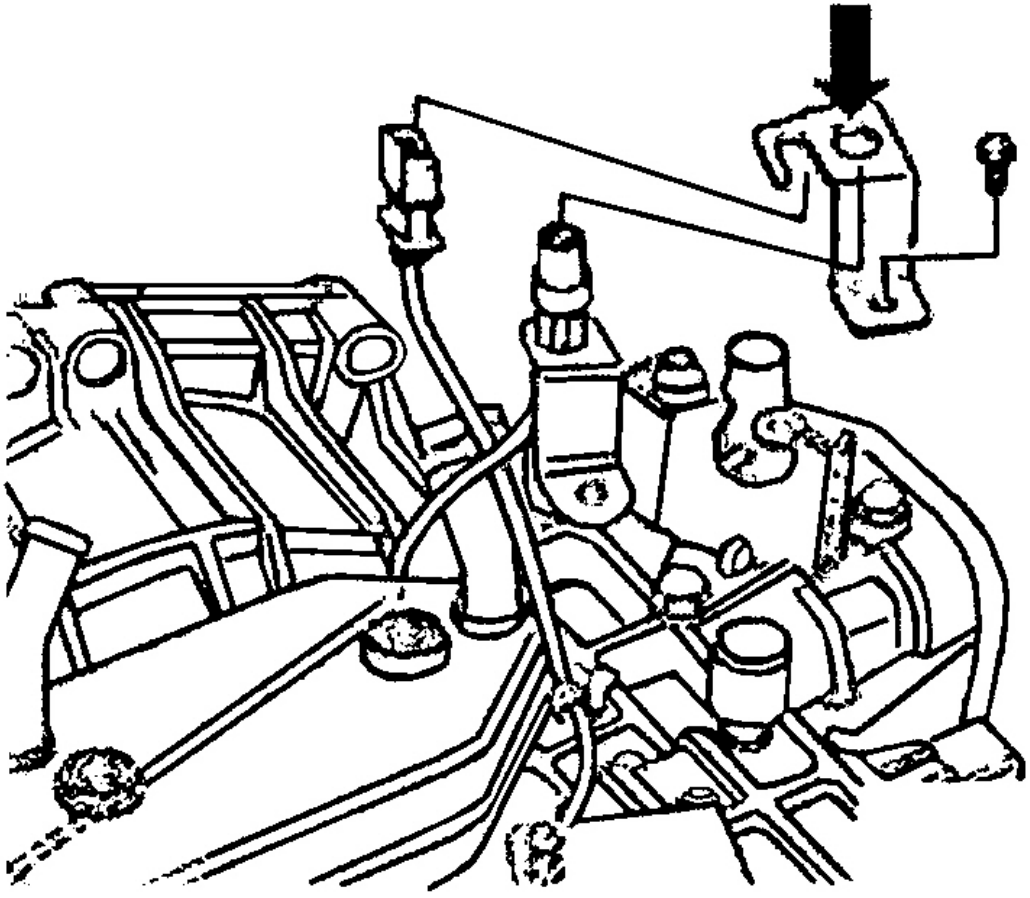


Fig. 143: Identifying Special Tools And Equipment (1 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 1 - Kukko 21/6 Internal extractor
- 4 - Kukko 22/2 Retainer

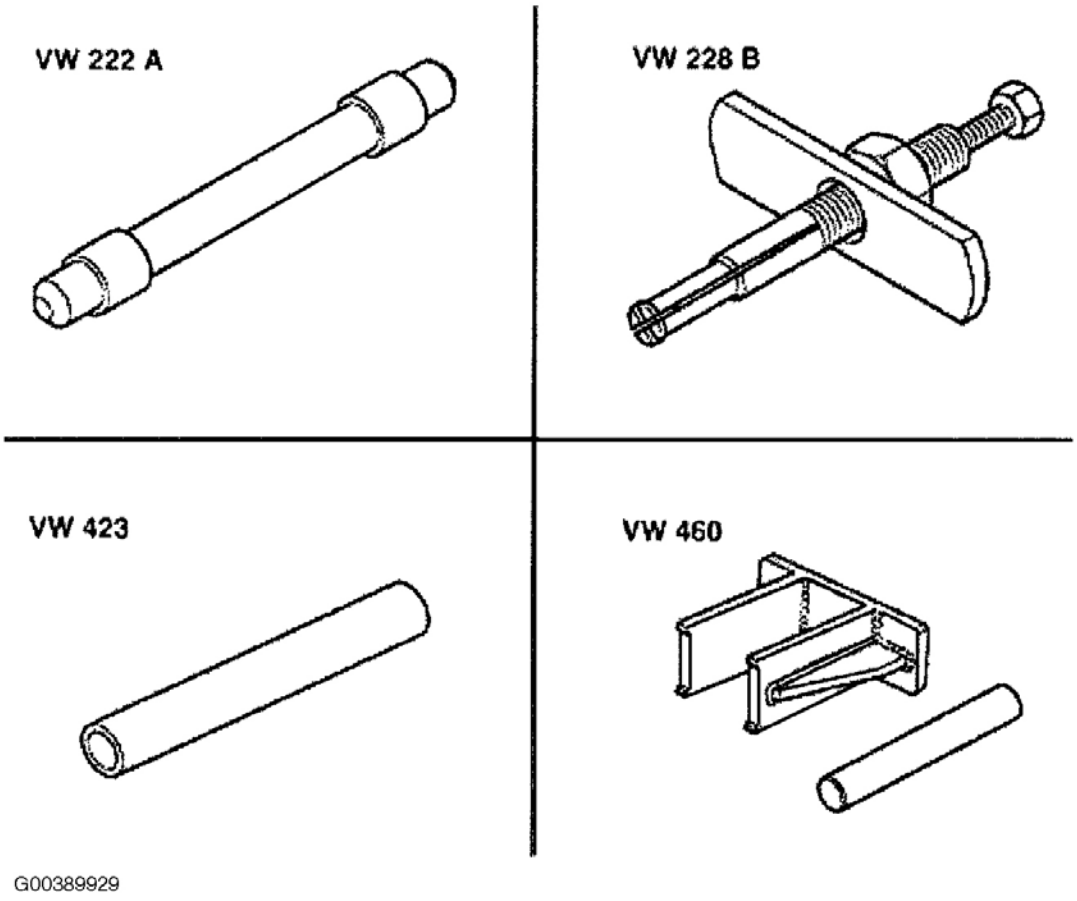


Fig. 144: Identifying Special Tools And Equipment (2 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

It is necessary to readjust the output shaft when the following components are replaced:

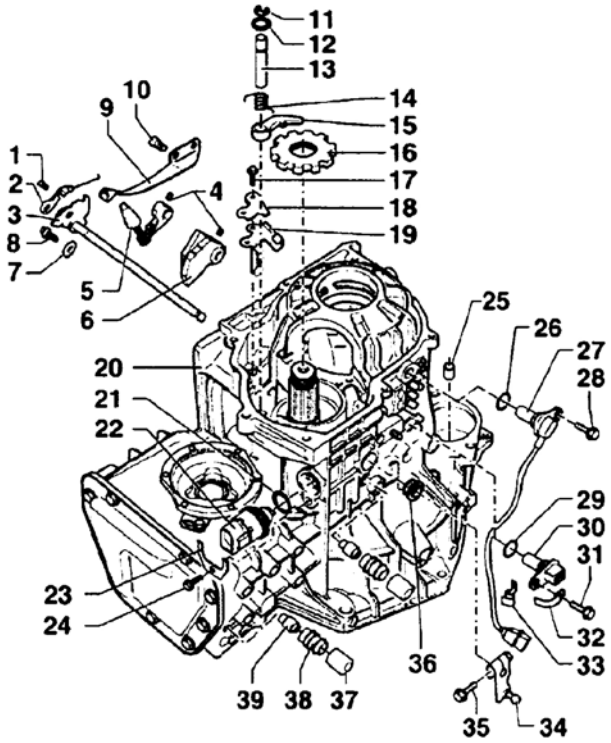
- Final drive
- Clutch housing

  or

- Tapered roller bearing

  Adjustment overview. See **Adjustment overview**

- Press small tapered roller bearing outer race together with a 0.65 mm thick shim into clutch housing. See **Output shaft, disassembling and assembling** .
- Insert output shaft and tighten nuts for bearing support to 25 N.m, then turn 90°.
- Mount dial gauge (3 mm measuring range) and set to "0" with 1 mm preload.



Note:
The output gear must be removed to disassemble and assemble the parking lock.

1. Bolt, 4 Nm
2. Manual Selector Valve Control
3. Selector Shaft With Selector Segment
4. Spring Pin
5. Engaging Lever
   Insert together with selector shaft and detent segment
6. Detent Segment
   Insert together with selector shaft and engaging lever
7. Locking Washer
8. Bolt, 10 Nm
9. Spring For Selector Segment
10. Bolt, 10 Nm
11. O-Ring (Always replace)
    Only install on shafts with groove for circlip
12. Washer
13. Shaft For Detent Lever
    Is secured by circlip and bearing cap of drive pinion
14. Return Spring
15. Detent Lever
16. Parking Lock Gear
    Rounded side faces teeth of drive pinion
17. Bolt, 14 Nm
18. Supporting Plate
19. Guide Plate
    Insert before supporting plate
20. Transmission Housing
    It is not necessary to remove the drive gear to disassemble the parking lock
21. O-Ring (Always replace)
22. Multi-Function Transmission Range (TR) Switch -F125-
23. Retainer
    For multi-function TR switch
24. Bolt, 10 Nm
25. Mounting Bushing
26. O-Ring (Always replace)
27. Vehicle Speed Sensor -G68-
28. Bolt, 10 Nm
29. O-Ring (Always replace)
30. Transmission Vehicle Speed Sensor -G38-
31. Bolt, 10 Nm
32. Retainer
    For wire to vehicle speed sensor
    Secure with bolt -item 31 -
33. Retaining Clip
    For wire to vehicle speed sensor
34. Lever
    For selector shaft
35. Bolt, 10 Nm
36. O-Ring
    Pry out with screwdriver
    Drive in flush with VW 423
37. Breather Cap
38. Breather
39. Breather Pipe
    Remove using pliers
    Drive onto stop with drift VW 460/2

G00389930

Fig. 145: Mounting Dial Gauge With 1 mm Preload
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Move output shaft up and down and note dial gauge reading (example: 0.30 mm).

Determining thickness of shim

The specified bearing preload is obtained by adding a constant preload figure of (0.20 mm) to the reading obtained (0.30 mm) and the thickness of the shim installed (0.65 mm).

Example:

DETERMINING THICKNESS OF SHIM (EXAMPLE)

Shim installed	0.65 mm
+ Reading	0.30 mm
+ Preload (constant)	0.20 mm
Thickness of shim	1.15 mm

- Remove output shaft and pull out small tapered roller bearing outer race. See **Output shaft, disassembling and assembling**

The following adjustment shims are available:

SHIM THICKNESS SPECIFICATION (OUTPUT SHAFT)

Size (mm)	**Part No.**
0.65	020 311 391 P
0.70	020 311 391 Q
0.75	020 311 391
0.80	020 311 391 A
0.85	020 311 391 B
0.90	020 311 391 C
0.95	020 311 391 D
1.00	020 311 391 E
1.05	020 311 391 F
1.10	020 311 391 G
1.15	020 311 391 H
1.20	020 311 391 J
1.25	020 311 391 K
1.30	020 311 391 L
1.35	020 311 391 M
1.40	020 311 391 N

Varying tolerances make it possible to obtain the exact shim thickness required.

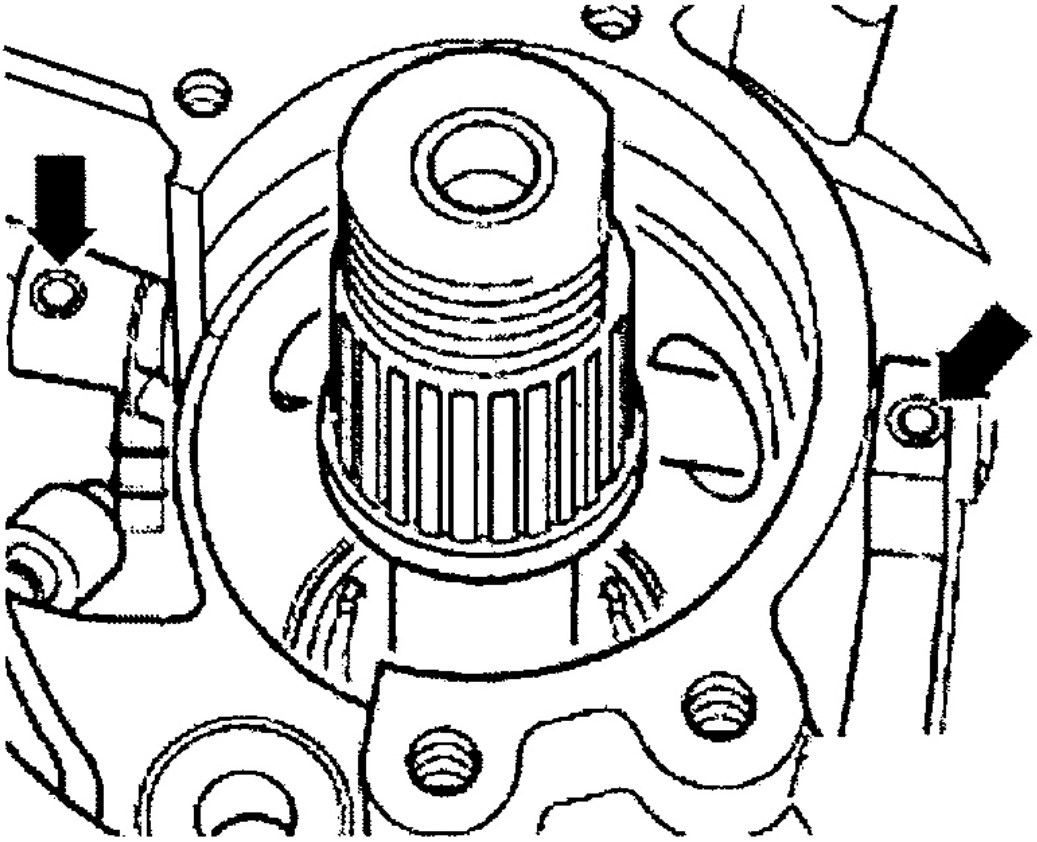
- Press in small tapered roller bearing outer race together with correct shim (See **Output shaft, disassembling and assembling**) and install output shaft. Tighten bearing support nuts in clutch housing

to 25 N.m an additional 1/4 turn 90°.

REVERSE SHAFT, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 454 Press piece
- VW 447 H Press plate
- VW 411 Press tool
- 12-551 Centering mandrel
- VW 401 Press plate
- VW 408 A Press tool



G00389931

Fig. 146: Identifying Special Tools And Equipment

Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: After disassembling, always replace needle roller bearing in clutch housing and reverse shaft support.

NOTE: The following list refers to items in Fig. 147 .

1. **Clutch housing**
2. **Needle roller bearing**
   - Pulling out. See **Pulling needle roller bearing out of clutch housing**
   - Pressing in. See **Pressing needle roller bearing into clutch housing**
3. **Reverse gear wheel**
4. **Circlip**
   - Always replace
5. **Reverse sliding gear wheel**
   - Before replacing remove circlip
   - Shoulder faces to reverse gear wheel
6. **Reverse shaft**
   - Removing. See **Assembly sequence**
7. **Needle roller bearing**
   - Pressing out. See **Pressing needle roller bearing out of reverse shaft support**
   - Pressing in. See **Pressing needle roller bearing into reverse shaft support**
8. **Reverse shaft support**
   - Removing and installing. See **Assembly sequence**

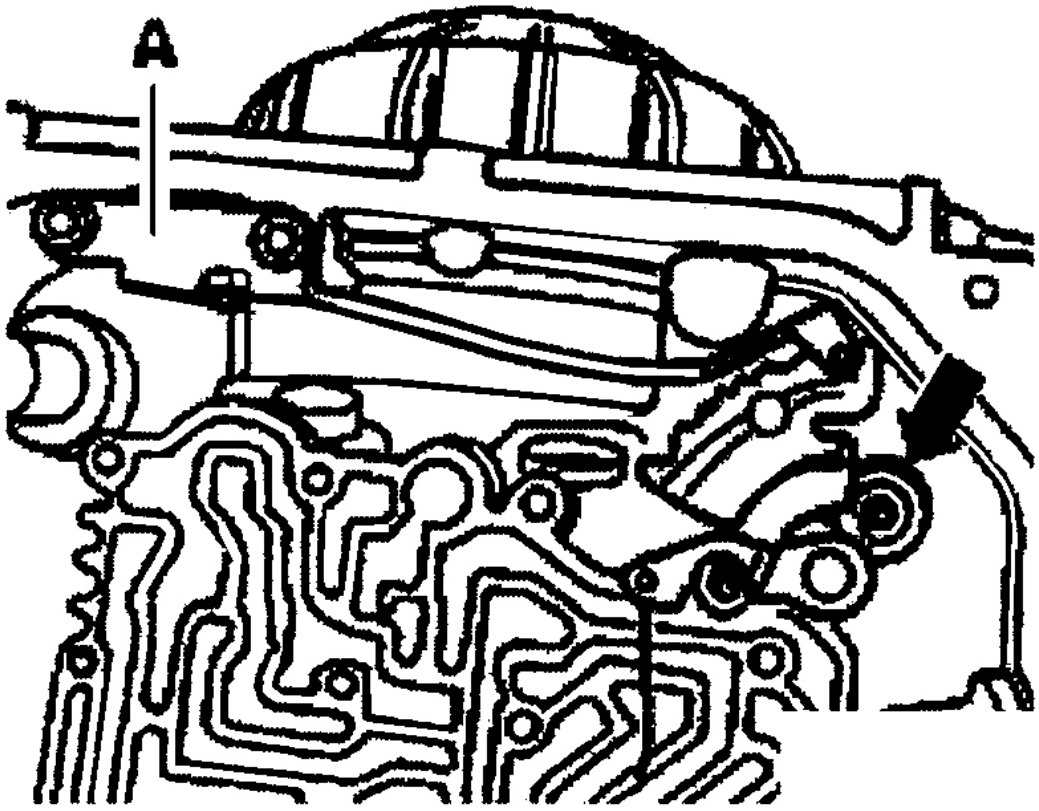


Fig. 147: Dissembled View Of Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling needle roller bearing out of clutch housing

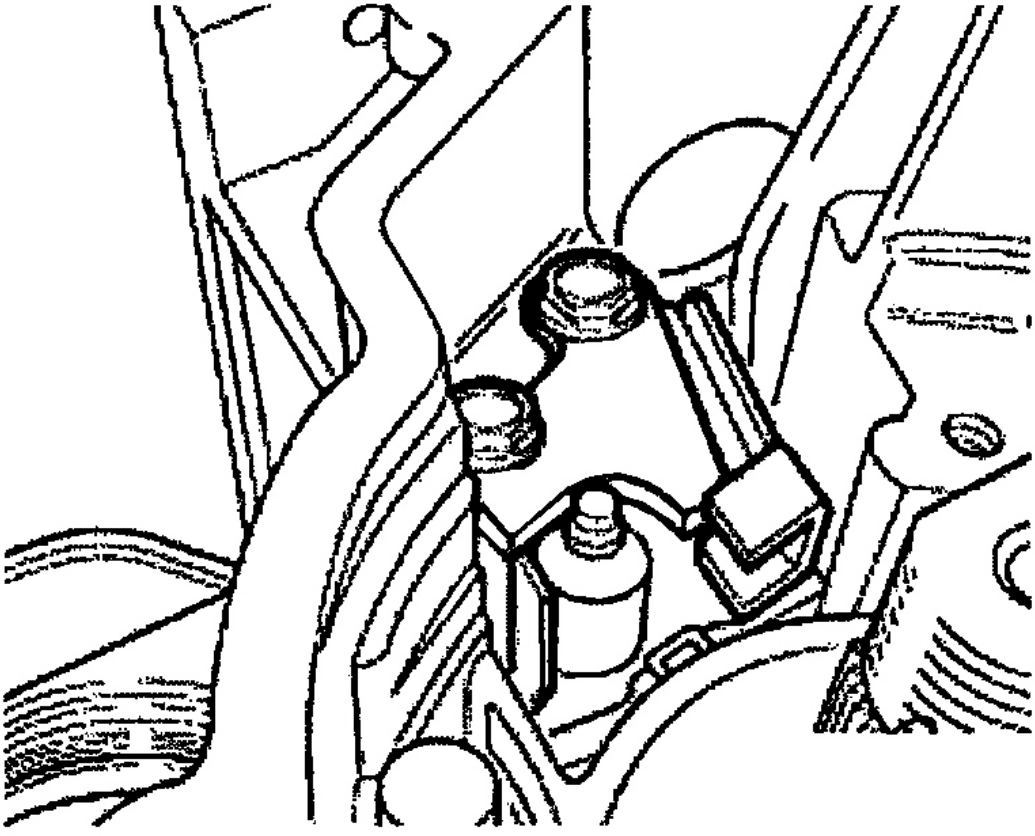
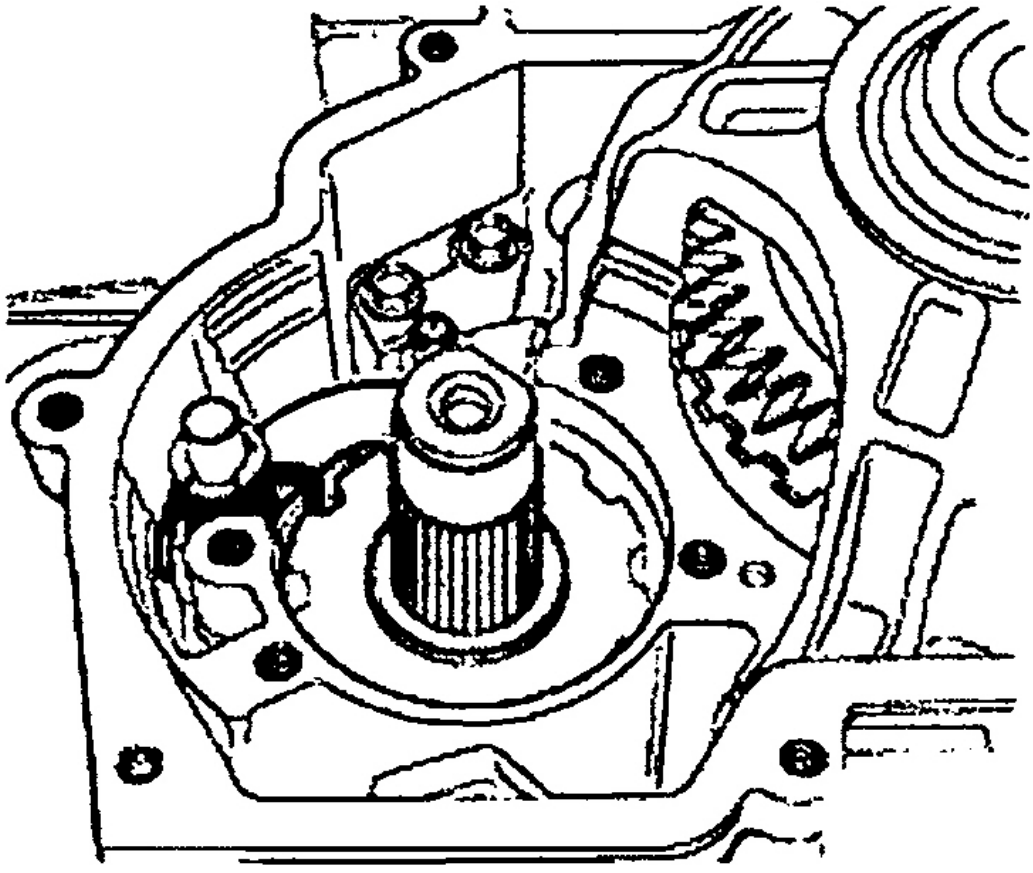


Fig. 148: Pulling Needle Roller Bearing Out Of Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Counter support, e.g. Kukko 22/1
B. Internal extractor 14.5 ... 18.5 mm, e.g. Kukko 21/2

NOTE: The needle bearing is destroyed during removal and must be replaced.

Pressing needle roller bearing into clutch housing



G00389934

Fig. 149: Pressing Needle Roller Bearing Into Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing needle roller bearing out of reverse shaft support

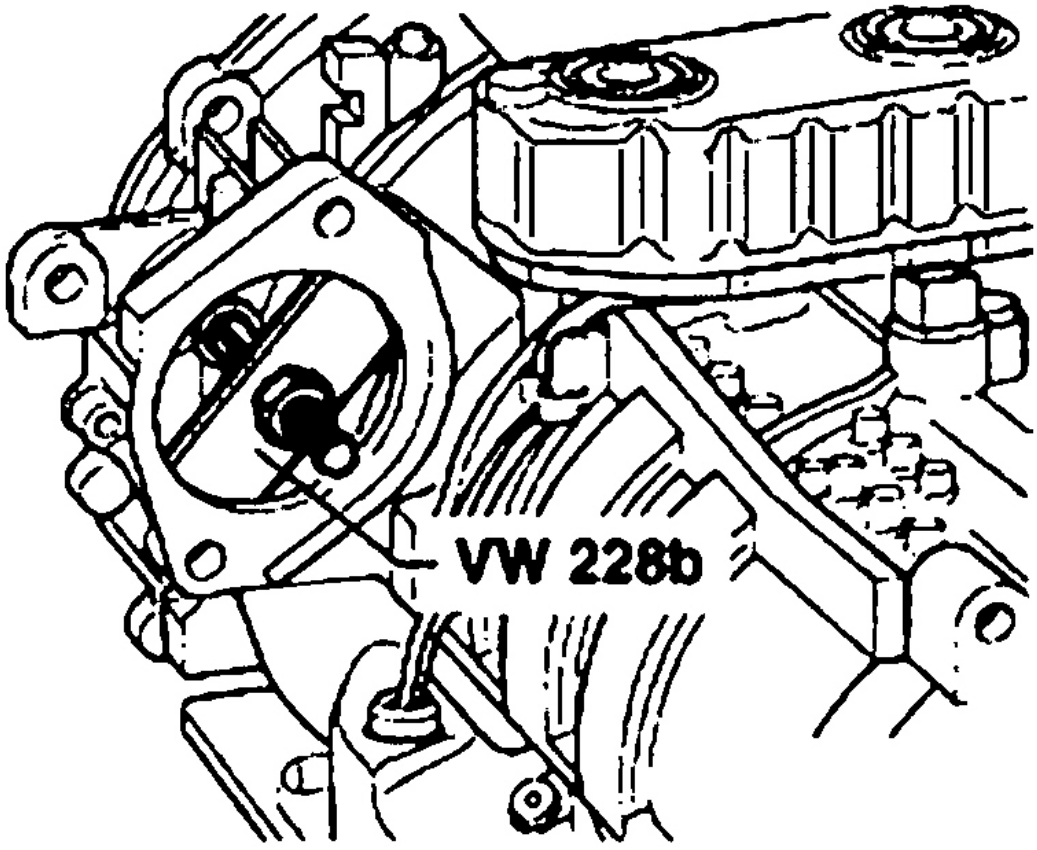


Fig. 150: Pressing Needle Roller Bearing Out Of Reverse Shaft Support
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing needle roller bearing into reverse shaft support

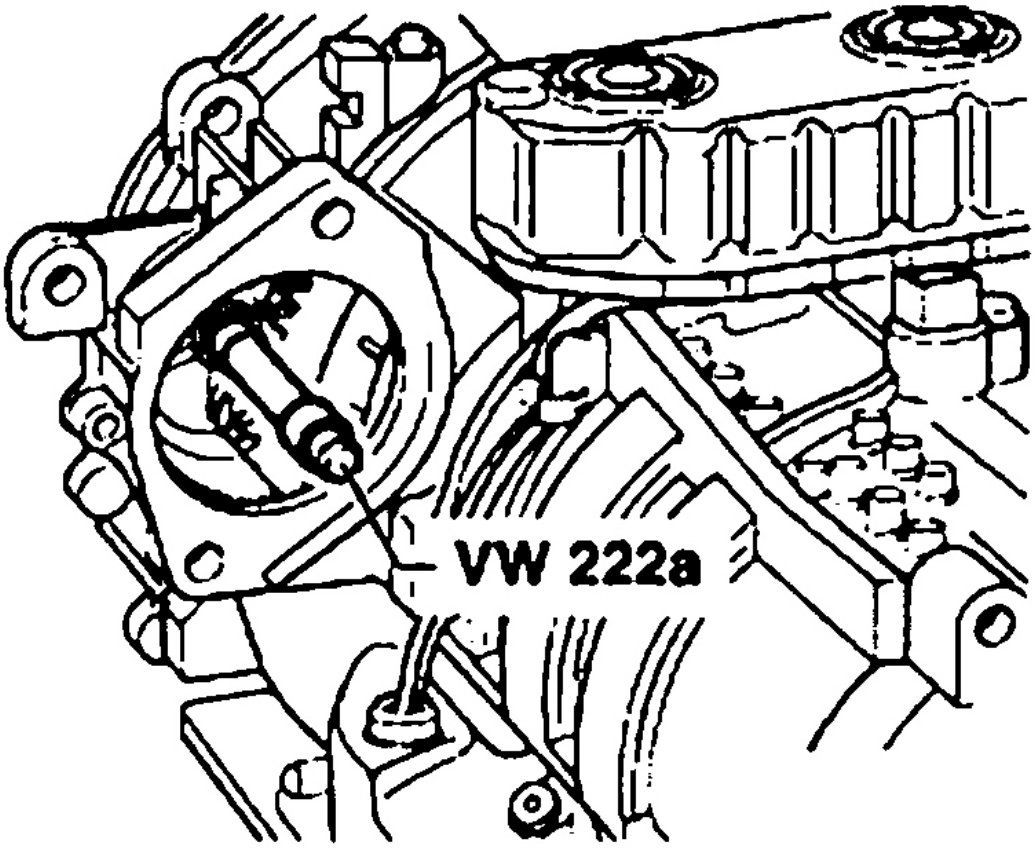


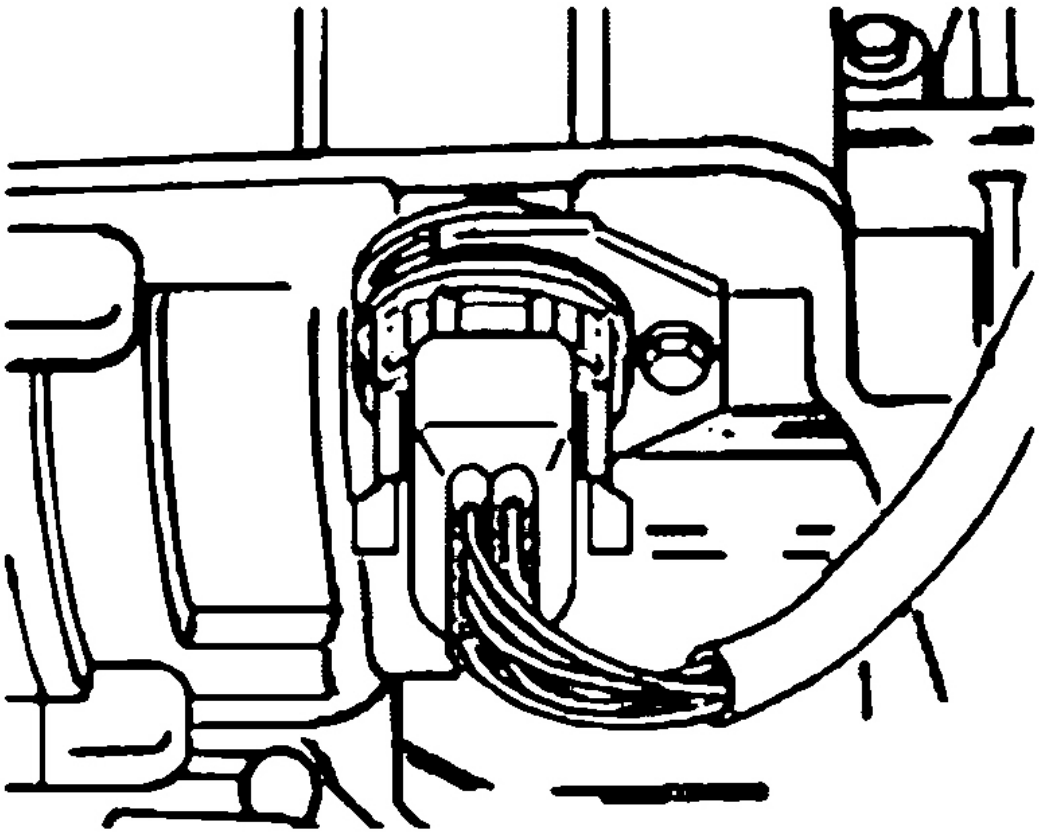
Fig. 151: Pressing Needle Roller Bearing Into Reverse Shaft Support
Courtesy of VOLKSWAGEN OF AMERICA, INC.

FINAL DRIVE, DIFFERENTIAL

FLANGE SHAFT OIL SEALS (TRANSMISSION INSTALLED), REPLACING

Left flange shaft oil seal, removing

Special tools and equipment



G00385566

Fig. 152: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VW 771 Multipurpose tool
- VW 771/37 Puller hooks
- 3106 Drift
- V.A.G 1331 Torque wrench
- V.A.G 1332 Torque wrench

Removing

- Remove center and left noise insulation tray under engine/transmission if installed.
- Remove drive shaft

  See **FRONT AXLE SHAFT**

- Remove flange shaft securing bolts by screwing two bolts into flange and counterhold flange shaft using a lever.
- Place container under transmission.
- Remove flange shaft with spring.
- Pull out seal for flange shaft with VW 771 and VW 771/37.

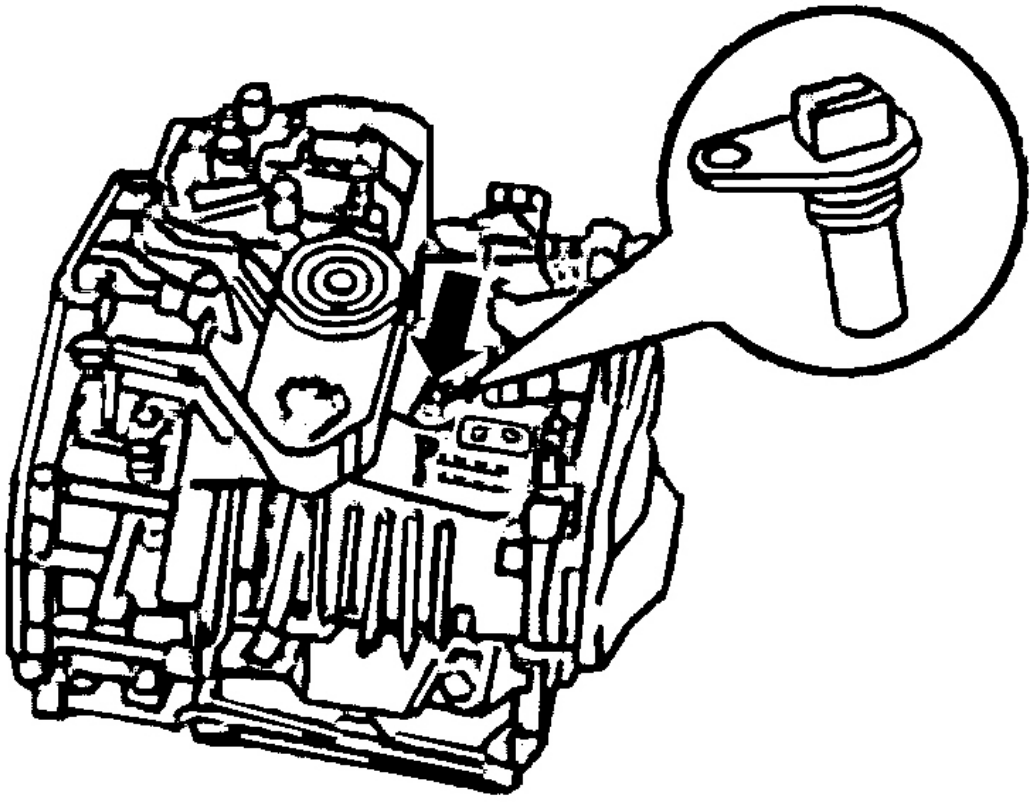


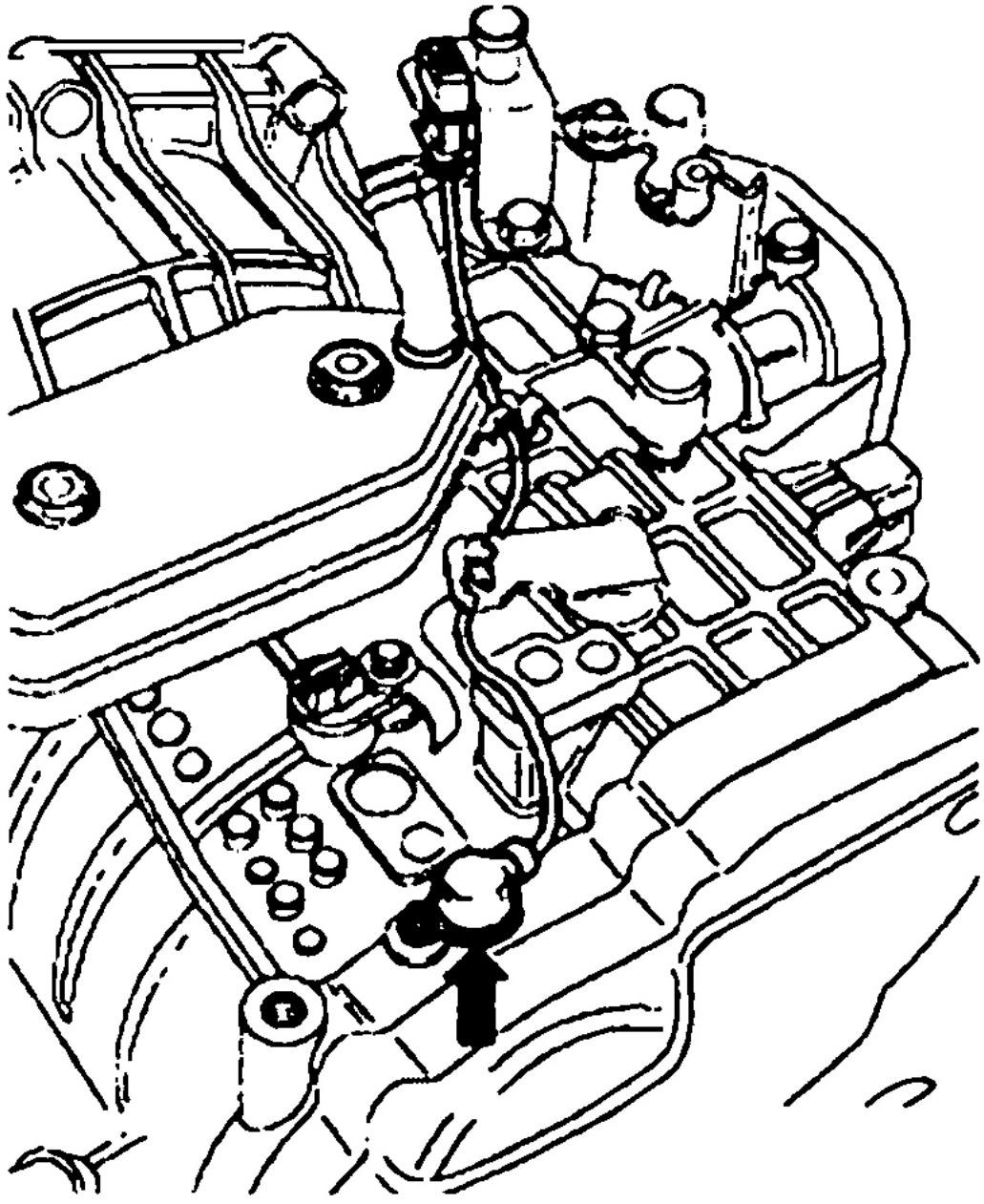
Fig. 153: Removing Left Oil Seal For Flange Shaft
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE:

- **Do not damage sleeve, otherwise leaks will occur.**
- **Replace sleeve if damaged. See Pulling sleeve in .**

Installing

- Drive new seal into sleeve onto stop, when doing this do not cant seal.



G00389937

Fig. 154: Installing Left Oil Seal Into Sleeve Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Fill space between sealing lip and dust lip with sealing grease G052 128 A1.

- Insert flange shaft.
- Install flange shaft with cone head bolt and tighten to prescribed torque. See **REMOVING** , item 18
- Install drive shafts to transmission.

  See **FRONT AXLE SHAFT** .

- Top off transmission oil. See **CHECKING FLUID LEVEL** .
- Install sound insulation trays.

Right flange shaft oil seal, removing

Special tools and equipment

Seal and sleeve are driven out in two pieces

- 3106 Drift
- 3253/2 Assembly tool
- V.A.G1331 Torque wrench

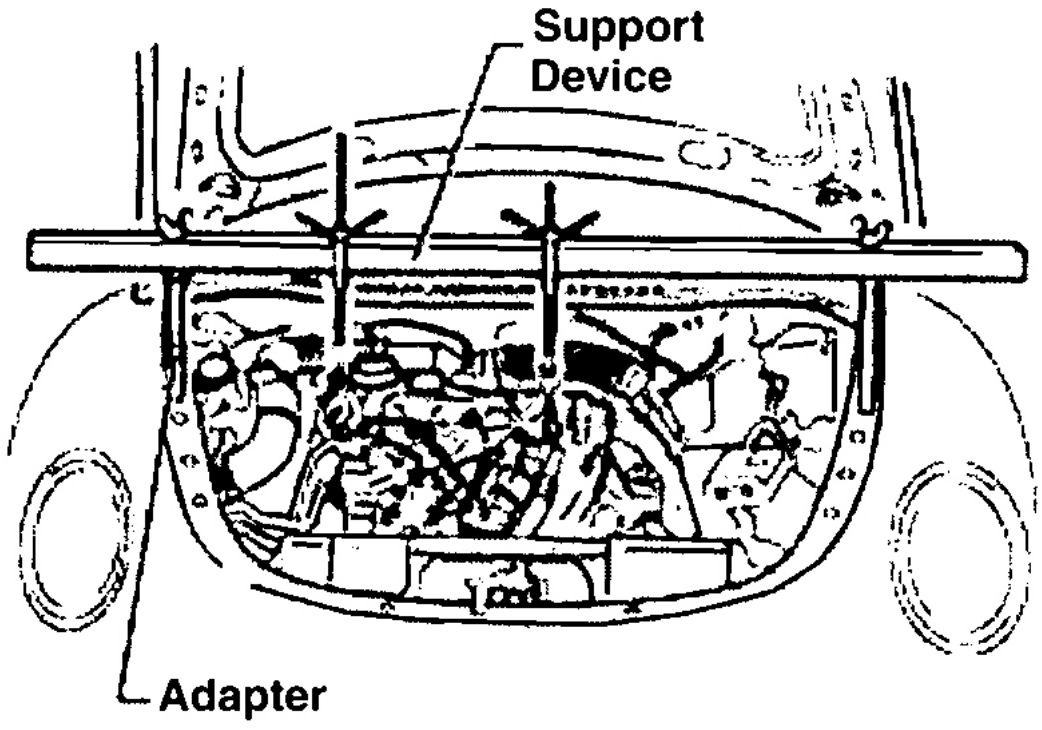


Fig. 155: Identifying Special Tools And Equipment (1 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- T10148 Press piece
- 3066 Assembly device
- VW 771 Multipurpose tool
- VW 771/37 Puller hooks
- V.A.G1331 Torque wrench

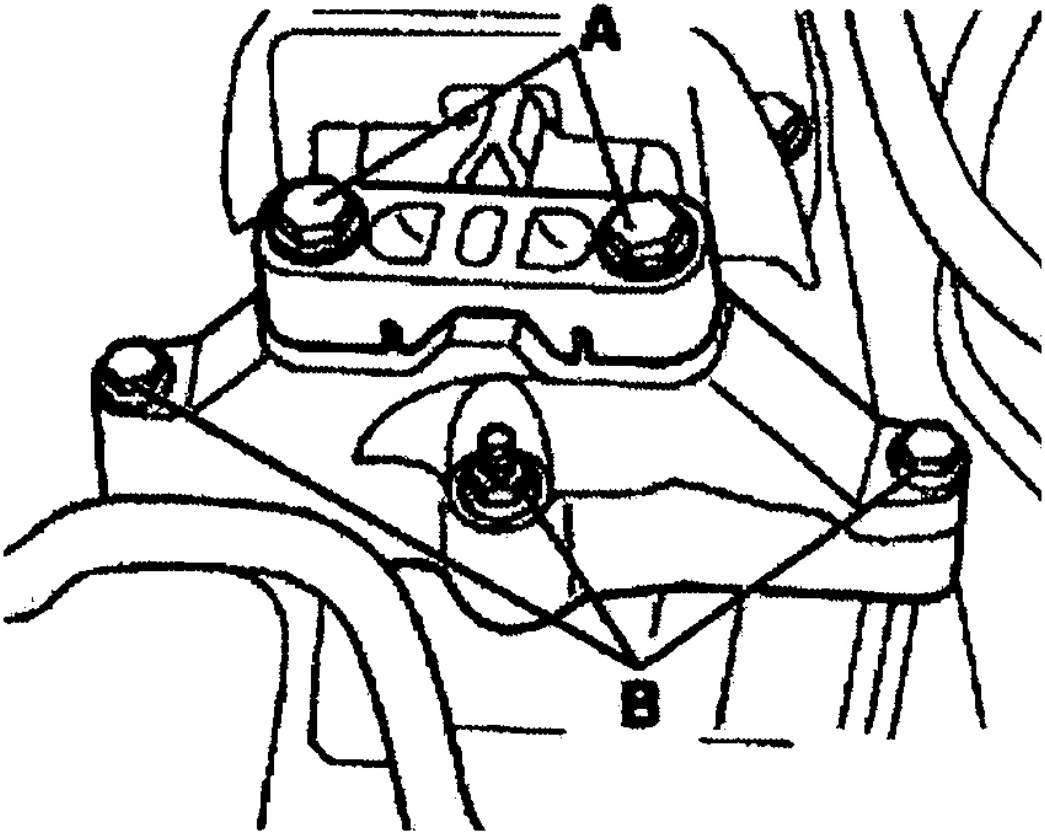


Fig. 156: Identifying Special Tools And Equipment (2 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing

- Remove center and left noise insulation tray under engine/transmission if installed.
- Turn steering to right onto full lock stop
- Remove drive shaft protective cover from engine if installed
- Disconnect drive shaft -1- from flange shaft.

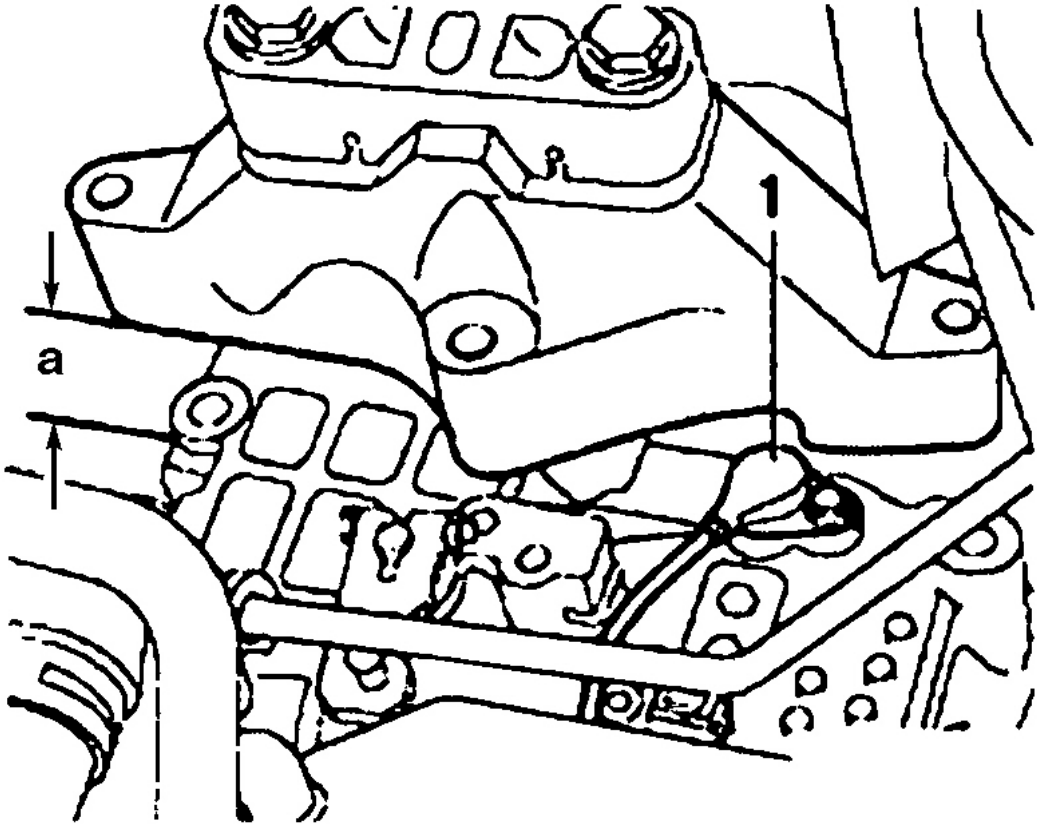


Fig. 157: Disconnecting Right Drive Shaft From Right Flange Shaft
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Tie-up drive shaft as high as possible. Do not damage paint on drive shaft.
- Place container under transmission and engine.
- Disconnect oil return line for turbocharger from engine, if installed (arrow).

  See CHARGE AIR SYSTEM WITH TURBOCHARGER, TURBOCHARGER WITH ATTACHMENTS, REMOVING AND INSTALLING

- Remove flange shaft securing bolts by screwing two bolts into flange and counterhold flange shaft using a lever.
- Remove flange shaft with spring.

Seal and sleeve are driven out in two pieces:

Pry seal with a screw driver -A-. To do this, support the screw driver on the assembly tool 3253/2.

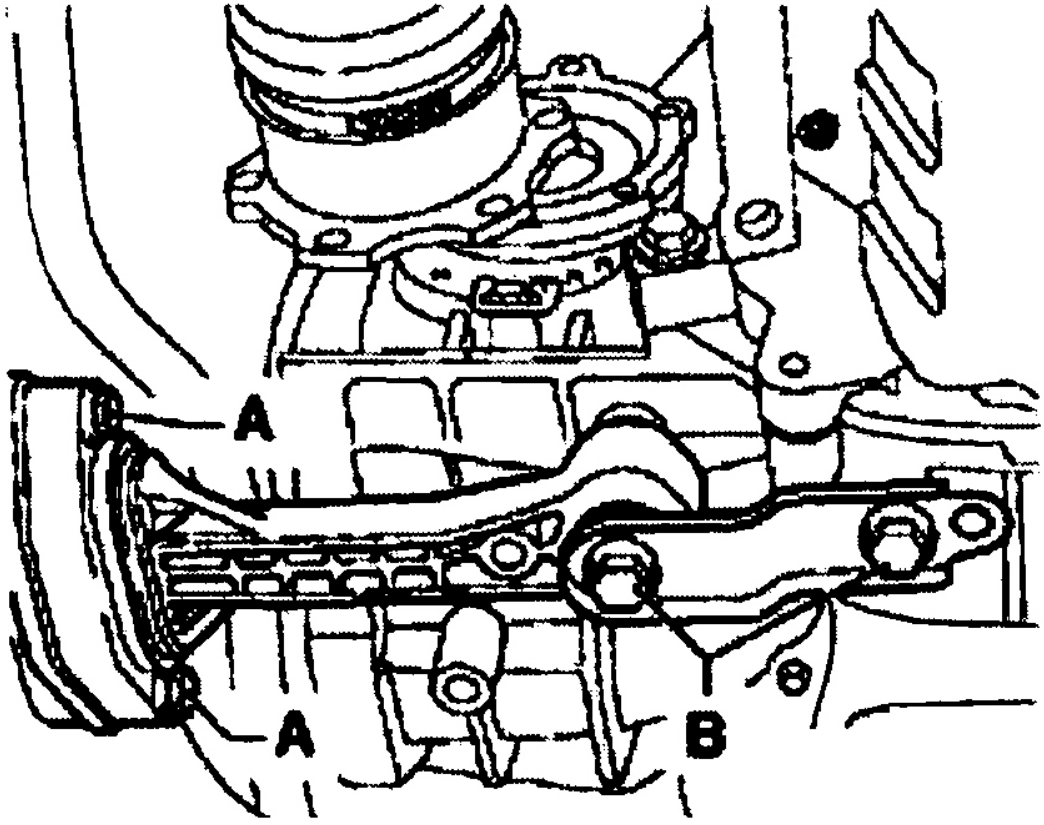


Fig. 158: Removing Right Flange Shaft Oil Seal
Courtesy of VOLKSWAGEN OF AMERICA, INC.

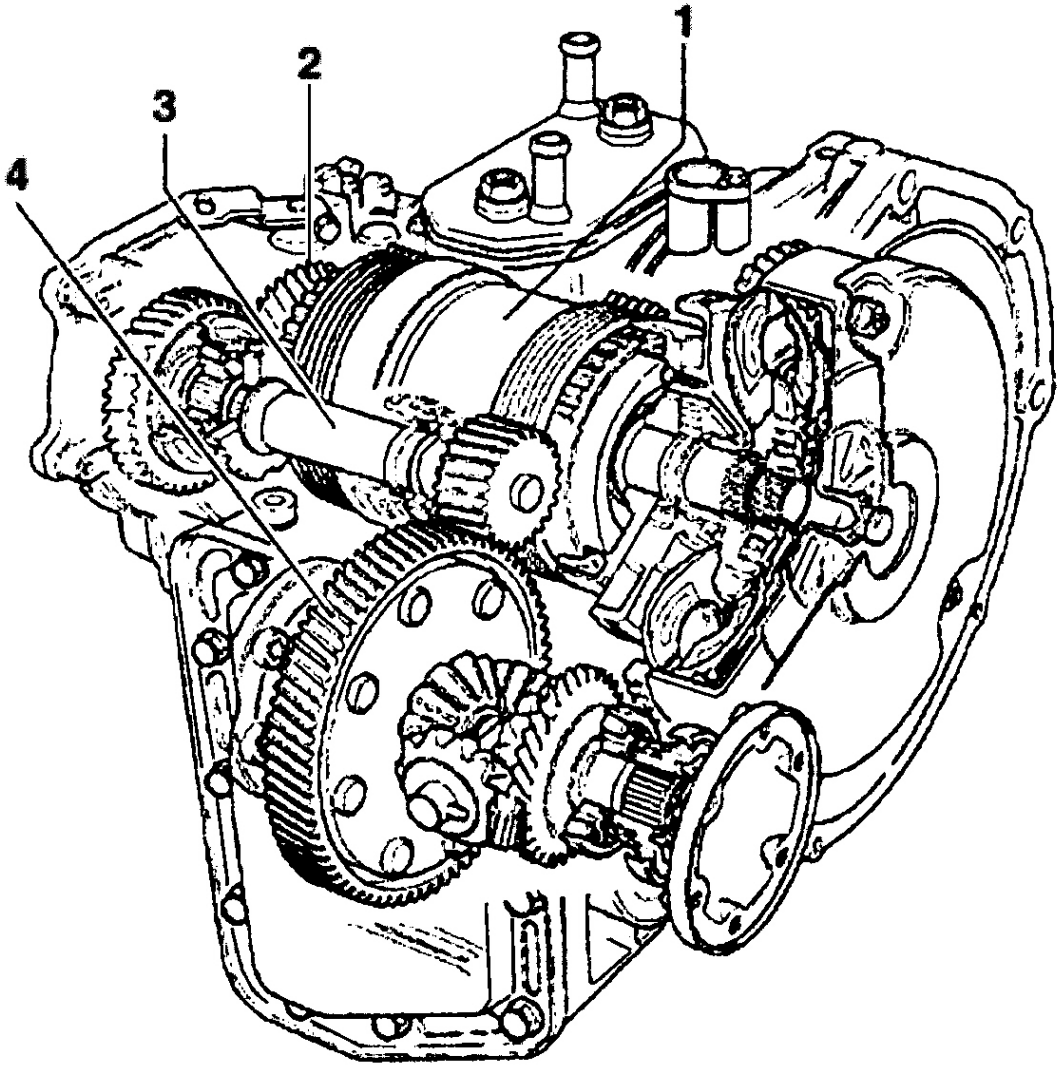
NOTE:

- **Do not damage sleeve, otherwise leaks will occur.**
- **Replace sleeve if damaged. See Pulling sleeve in .**

Seal and sleeve are driven out in one piece:

- Pull out seal and sleeve at the same time.

The inner diameter of the sleeve has a pad.



Final drive, disassembling and assembling

Repair overview of final drive

1 - Planetary gear

2 - Input gear

- Repairs on the input gear can only be performed once the individual components of the transmission have been removed.

3 - Drive pinion

4 - Differential

Fig. 159: Removing Right Flange Shaft Oil Seal And Sleeve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install the puller hook VW 771/37 directly behind the pad in the sleeve.
- Use force to press the puller hook VW 771/37 in the sleeve during the driving out sequence.

Installing

Seal and sleeve are driven out in two pieces:

- Do not bend seal when driving new seal into sleeve onto stop.

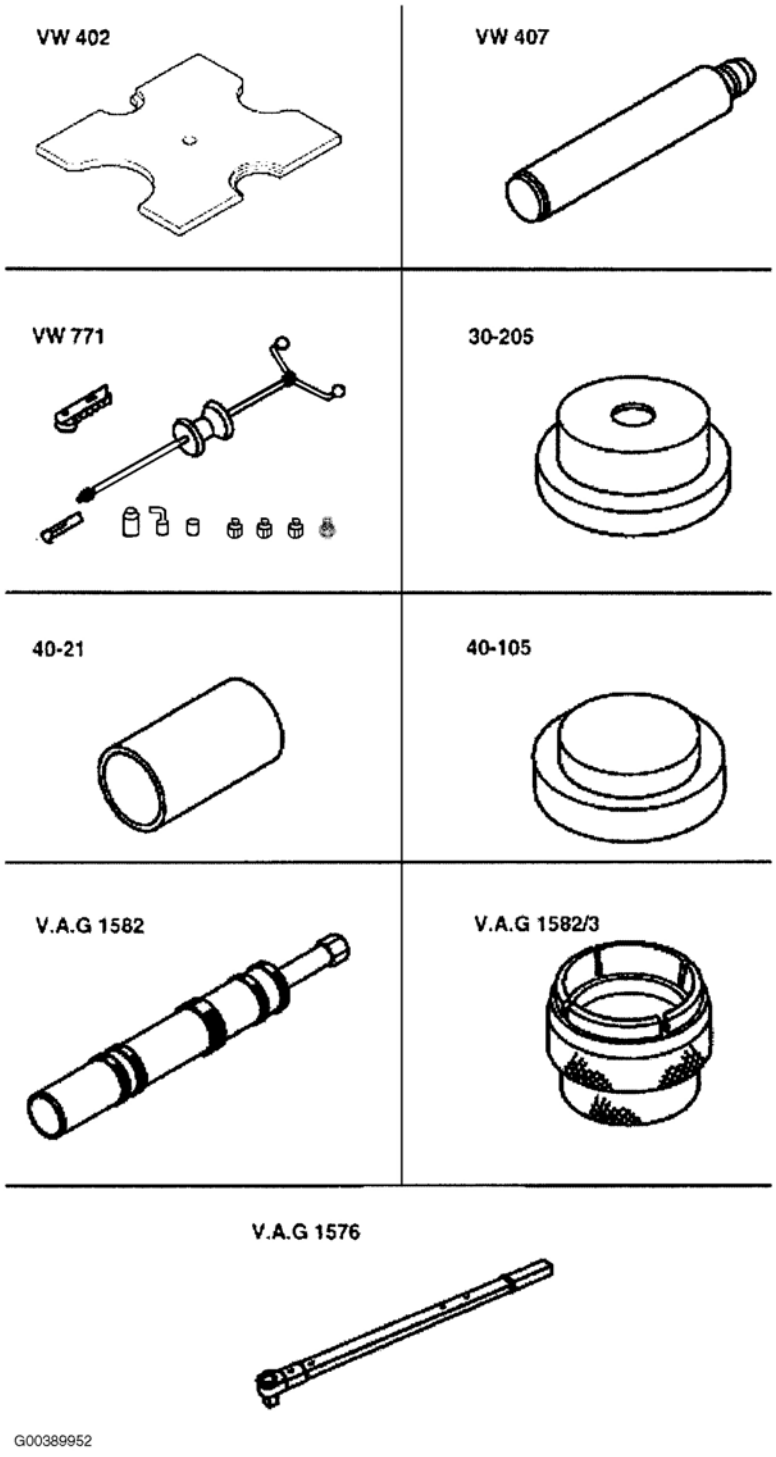
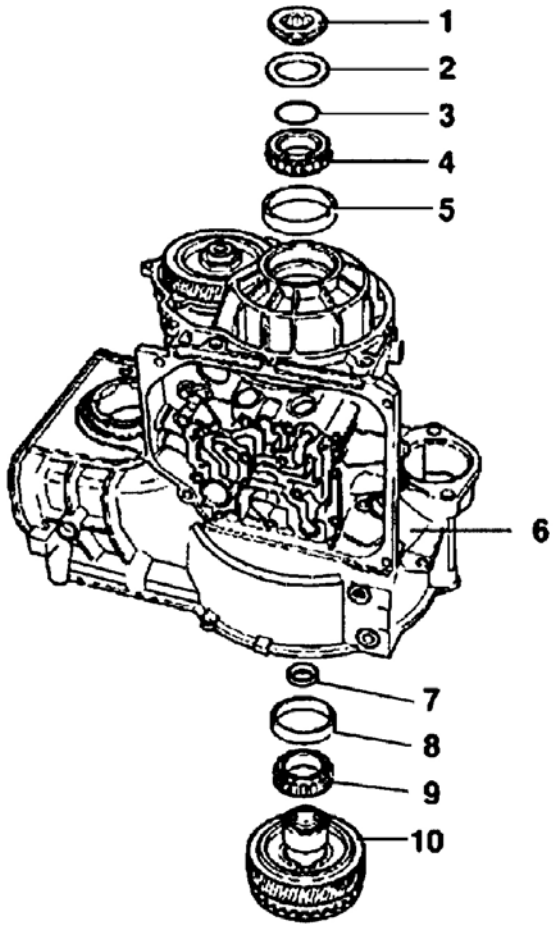


Fig. 160: Installing Right Seal And Sleeve Into Flange Shaft (Seal And Sleeve Are Driven Out In Two Pieces)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Fill space between sealing lip and dust lip with sealing grease G052 128 A1.
- Insert flange shaft.

Seal and sleeve are driven out in one piece:

- Clean the sitting place of seal in transmission.
- Pull seal and sleeve together.



Note:

Drive pinion and differential do not need to be removed.

1 - Socket head fastener, 250 Nm
- Engage parking lock to remove and install
- Use 22 mm wrench socket
- Before installing socket head fastener insert axial needle bearing (item - 7 -)

2 - Dished washer
- Curved side faces socket head fastener

3 - Shim

4 - Tapered roller bearing inner race
- After measuring thickness of shim, install onto input gear with locking fluid AMV 185 101 A1

5 - Tapered roller bearing outer race
- Drive out with drift
- Drive in with 30-205
- Insert with locking fluid AMV 185 101 A1

6 - Transmission housing

7 - Axial needle bearing
- Install with flat side facing input gear
- Insert into input gear before installing socket head fastener (item -1-)

8 - Tapered roller bearing outer race
- Drive out with drift
- Drive in with 30-205 and appropriately long drift
- Insert with locking fluid AMV 185 101 A1

9 - Tapered roller bearing inner race
- Insert with locking fluid AMV 185 101 A1

10 - Input gear
- With impulse wheel for vehicle speed sensor -G68-
- If signs of damage exist, always replace input gear and output gear together
- If input gear is replaced, adjust planet carrier

G00389953

Fig. 161: Installing Right Seal And Sleeve Into Flange Shaft (Seal And Sleeve Are Driven Out In One Piece)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Turn the spindle from the assembly device 3066 in the threaded piece from the differential.
B. Nut M12

- Pull in seal with sleeve using press piece T10148 onto stop by turning the nut -B-.
- Fill space between sealing lip and dust lip with sealing grease G052 128 A1.
- Insert flange shaft.

Continued for all vehicles

- Install flange shaft with cone head bolt and tighten to prescribed torque. See **REMOVING** , item 18.
- Disconnect oil return line for turbocharger from engine, if installed (arrow).

  See CHARGE AIR SYSTEM WITH TURBOCHARGER, TURBOCHARGER WITH ATTACHMENTS, REMOVING AND INSTALLING

- Connect drive shaft -1- to flange shaft.

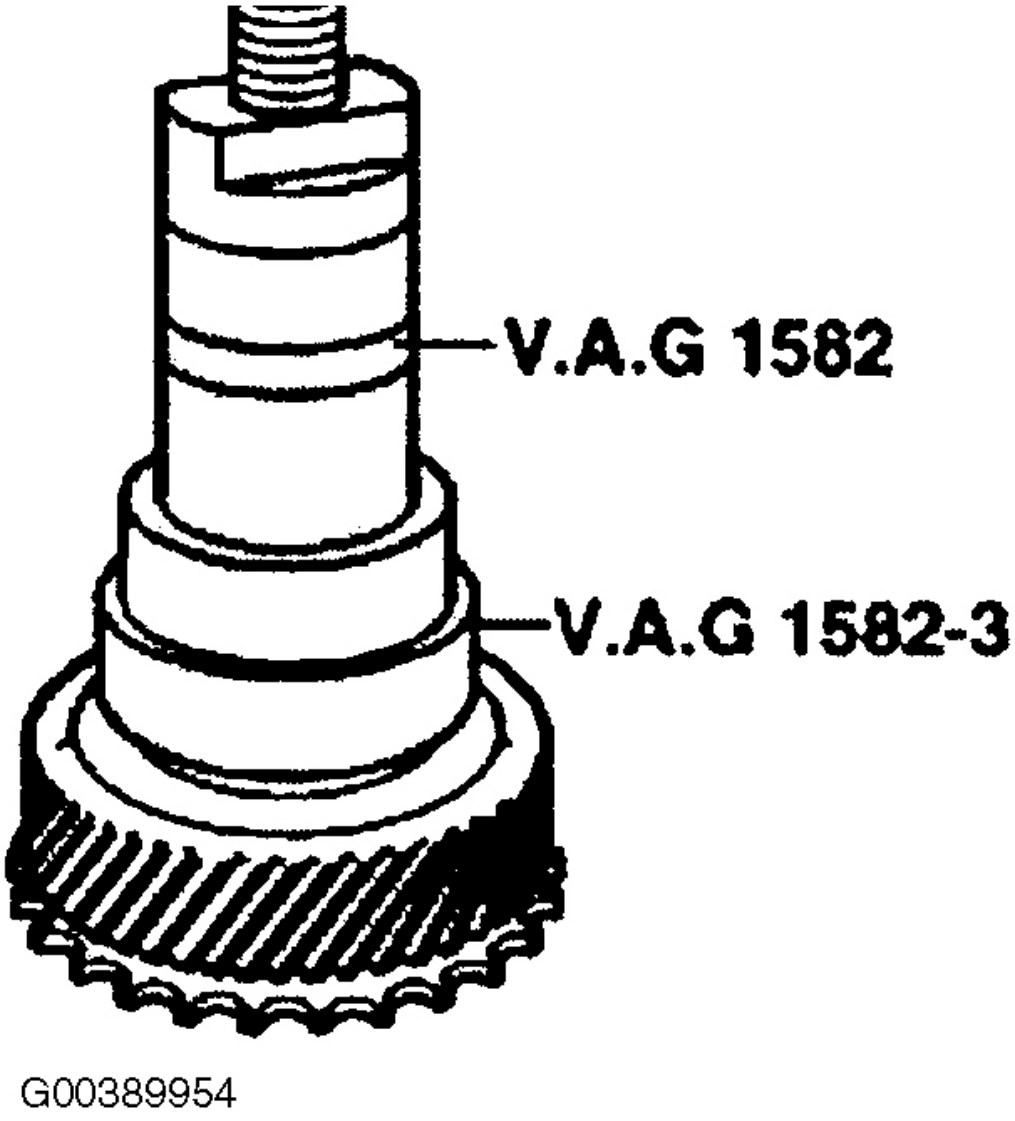


Fig. 162: Disconnecting Oil Return Line For Turbocharger From Engine
Courtesy of VOLKSWAGEN OF AMERICA, INC.

See **FRONT AXLE SHAFT**

- Screw drive shaft protective cover if installed
- Screw protective cover for drive shaft if installed.
- Top off transmission oil. See **CHECKING FLUID LEVEL** .

- Install sound insulation tray.

Tightening torques:

- Flange shaft to transmission (conical head bolt). See **REMOVING** , item 18.
- Protective cover for drive shaft to engine

DIFFERENTIAL, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- V.A.G 1582 Puller
- V.A.G 1582/3 Grip
- VW 412 Press tool
- 40-105 Thrust plate
- VW 401 Press plate
- VW 402 Press plate

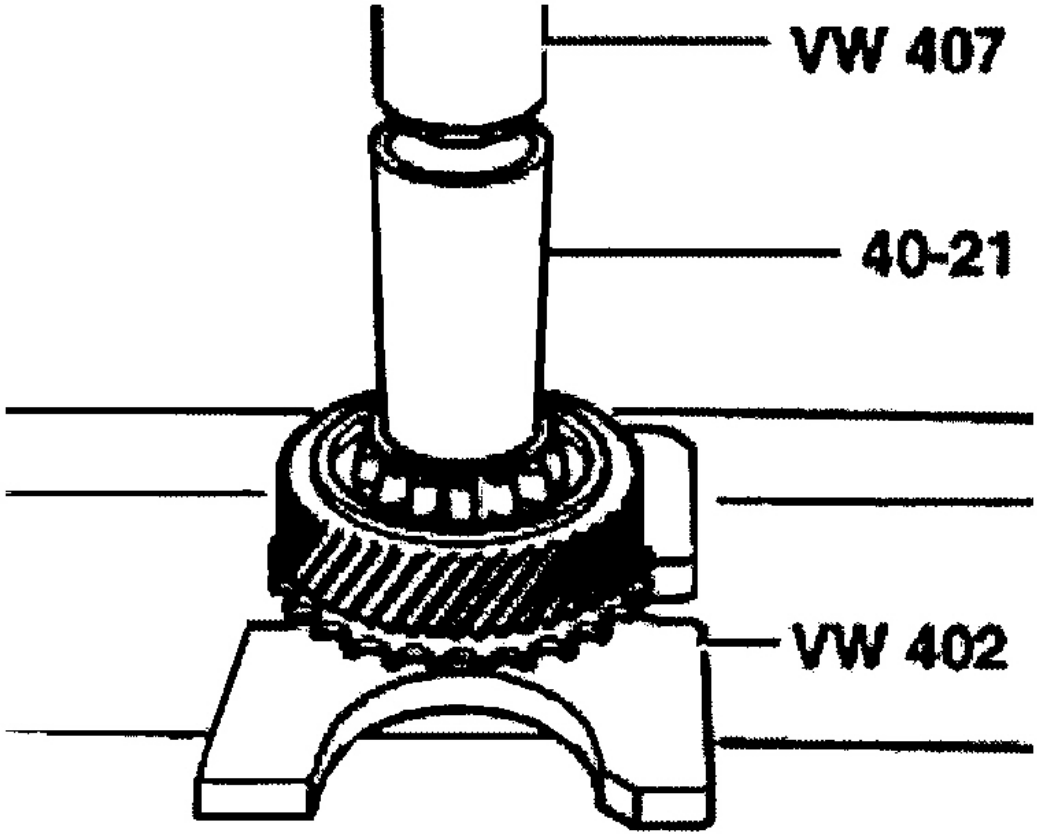
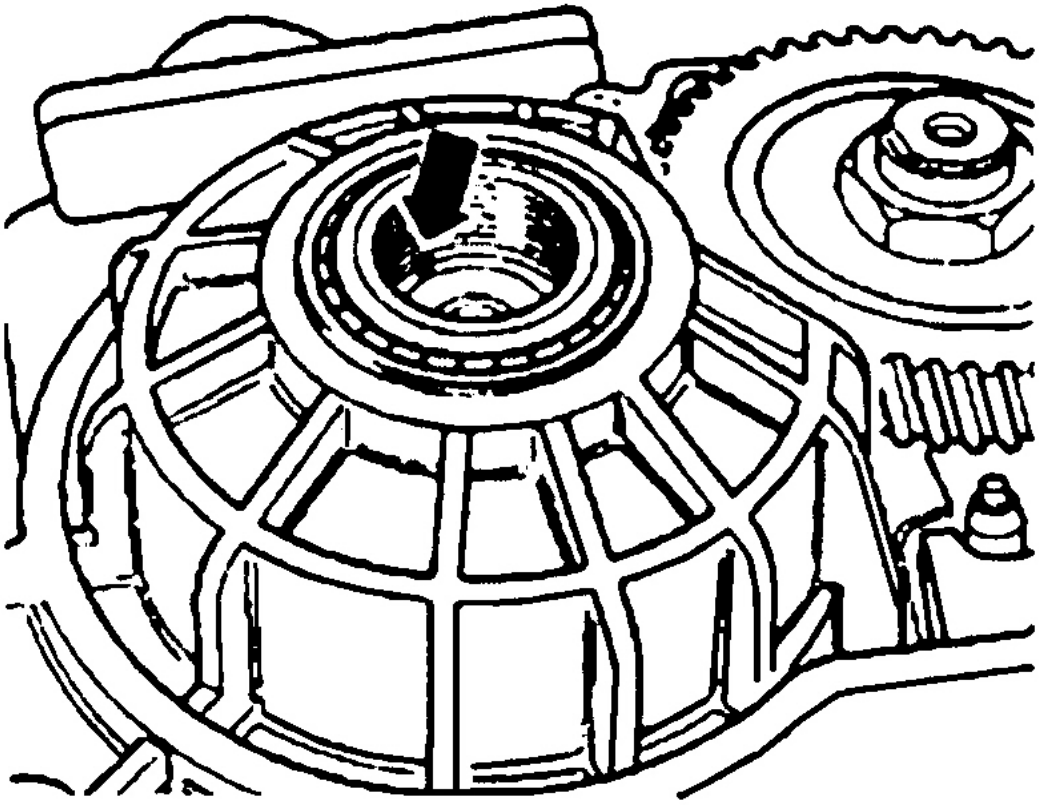


Fig. 163: Identifying Special Tools And Equipment (1 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VW 408 A Press tool
- VW 473 Thrust piece
- 30-205 Thrust plate
- 3144 Sleeve
- 2007 Thrust pad



G00389956

Fig. 164: Identifying Special Tools And Equipment (2 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE:

- **Heat tapered roller bearing inner race to 100° C before installing.**
- **Always replace both tapered roller bearings together as a set.**
- **Adjust differential if tapered roller bearings, differential housing, transmission housing or clutch housing are being replaced. See DIFFERENTIAL, ADJUSTING .**

NOTE: The following list refers to items in Fig. 165 .

1. **Transmission housing**
2. **Bolt**
3. **Differential cage**

- Bolt to final drive gear

4. **Final drive gear wheel**
   - Riveted in production
   - Is paired with output shaft, only replace as a set
   - Pressing off. See **Pressing off final drive gear**
   - Installation position. See **Installation position of final drive gear wheel**
   - Heat to 100° C before installing
   - Install to differential housing. See **Heating final drive gear wheel to approx. 100° C and installing** .
   - Bolted. See **Bolting final drive gear and differential housing together**
5. **Backing plate**
6. **Nut, 70 N.m 7**
7. **Shim**
   - For differential
   - Determining thickness. See **DIFFERENTIAL, ADJUSTING**
8. **Tapered roller bearing outer race**
   - Pulling out **Pulling tapered roller bearing outer race out of transmission housing**
   - Pressing in. See **Pressing tapered roller bearing outer race into transmission housing**
9. **Tapered roller bearing inner race**
   - Pulling off. See **Pulling off tapered roller bearing inner race**
   - Pressing on **Pressing on tapered roller bearing inner race**
10. **Differential housing**
    - With riveted final drive gear
    - When replacing final drive gear drill out rivet heads. See **Drilling out rivet heads**
    - Attaching final drive gear with bolts. See **Bolting final drive gear and differential housing together**
11. **Speedometer drive wheel**
    - Install onto differential housing as far as stop before pressing on inner race
12. **Tapered roller bearing inner race**
    - Pulling off. See **Pulling off tapered roller bearing inner race**
    - Pressing on **Pressing on tapered roller bearing inner race**
13. **Tapered roller bearing outer race**
    - Pressing out. See **Pressing tapered roller bearing outer race out of clutch housing**
    - Pressing in. See **Pressing tapered roller bearing outer race into clutch housing**
14. **Clutch housing**
15. **15-Sleeve**
    - Installed together with springs behind flange shafts
    - To accept oil seal (item 16)

- Removing and installing. See **Pulling sleeve in**

16. **Oil seal**
    - Replacing with transmission installed. See **FLANGE SHAFT OIL SEALS (TRANSMISSION INSTALLED), REPLACING** .
17. **One piece oil seal and sleeve**
    - If seal is damaged, replace oil seal and sleeve together. See **FLANGE SHAFT OIL SEALS (TRANSMISSION INSTALLED), REPLACING** .
18. **Cone head bolt, 25 N.m**
    - Bolt into threaded piece (item 26)
19. **Flange shaft**
    - Removing and installing. See **FLANGE SHAFT OIL SEALS (TRANSMISSION INSTALLED), REPLACING**
20. **Spring for flange shaft**
    - Installed behind flange shafts
21. **Thrust washer**
    - Installation position: Shoulder toward spring, tongue to tapered ring
    - Installation position with changed thrust washer. See **Changed thrust washer for tapered ring** .
22. **Tapered ring**
    - With grooves to secure thrust washer
    - Installation position: Taper toward differential housing
23. **Securing clip**
    - Holds tapered ring, thrust washer and spring in position when drive flange is removed
24. **One-piece thrust washer**
    - Coat with transmission oil when installing
25. **Sun gear**
    - Installing. See **Installing differential side gears and pinion gears**
26. **Threaded piece**
    - Installing. See **Installing differential side gears and pinion gears**
27. **Differential pinion shaft**
    - Knock out with drift
    - Installing. See **Installing differential side gears and pinion gears**
28. **Spring pin**
    - For securing planet pinion axis shaft
    - Removing and installing. See **Removing and installing differential pinion shaft spring pin**
29. **Differential pinion gear**
    - Installing. See **Installing differential side gears and pinion gears**
30. **Differential side gear**
    - Installing. See **Installing differential side gears and pinion gears**

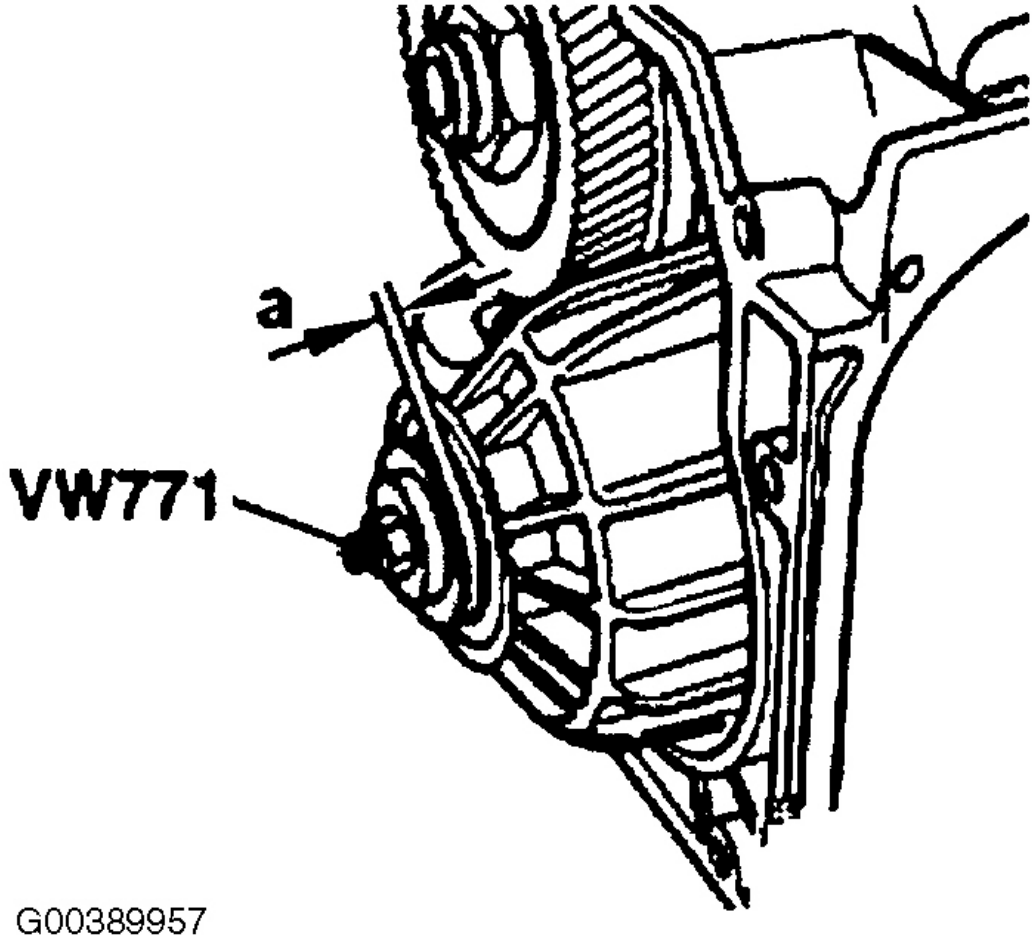


Fig. 165: Exploded View Of Differential Assembly
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing tapered roller bearing outer race out of clutch housing

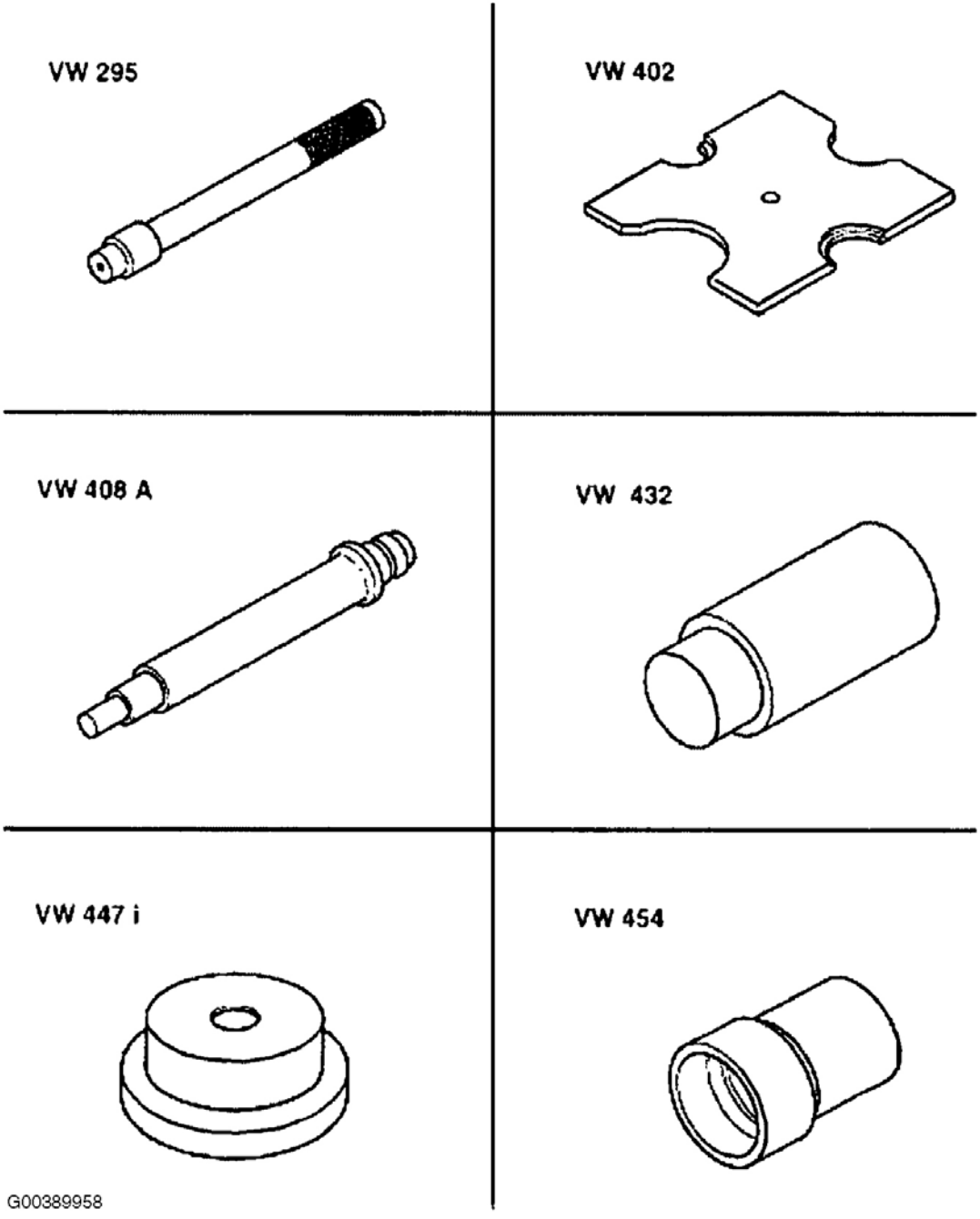


Fig. 166: Pressing Tapered Roller Bearing Outer Race Out Of Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing tapered roller bearing outer race into clutch housing

- For transmissions with springs behind flange shafts, first remove mounting sleeve for flange shaft seal.

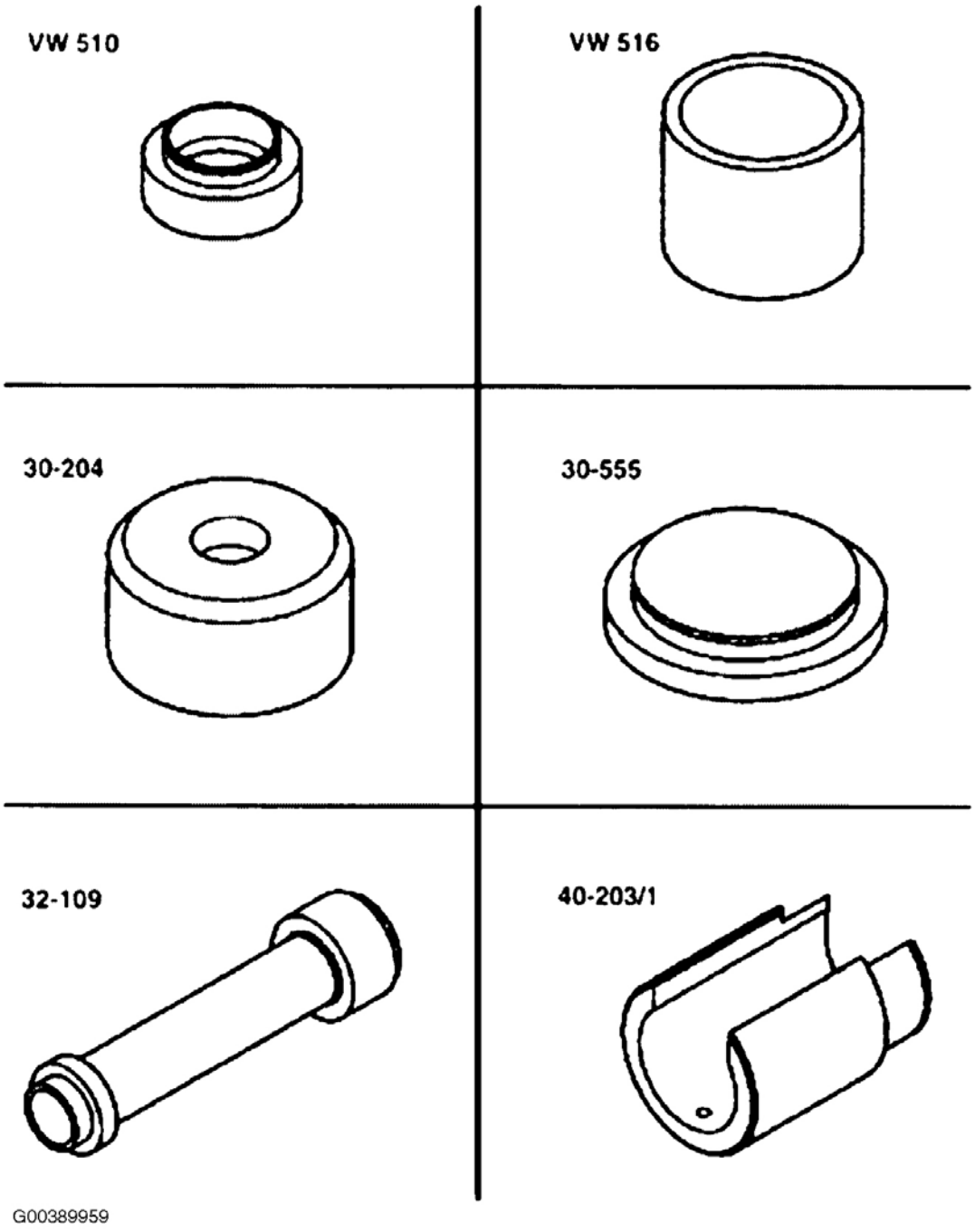


Fig. 167: Pressing Tapered Roller Bearing Outer Race Into Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

No shim is installed in the clutch housing end.

Pulling off tapered roller bearing inner race

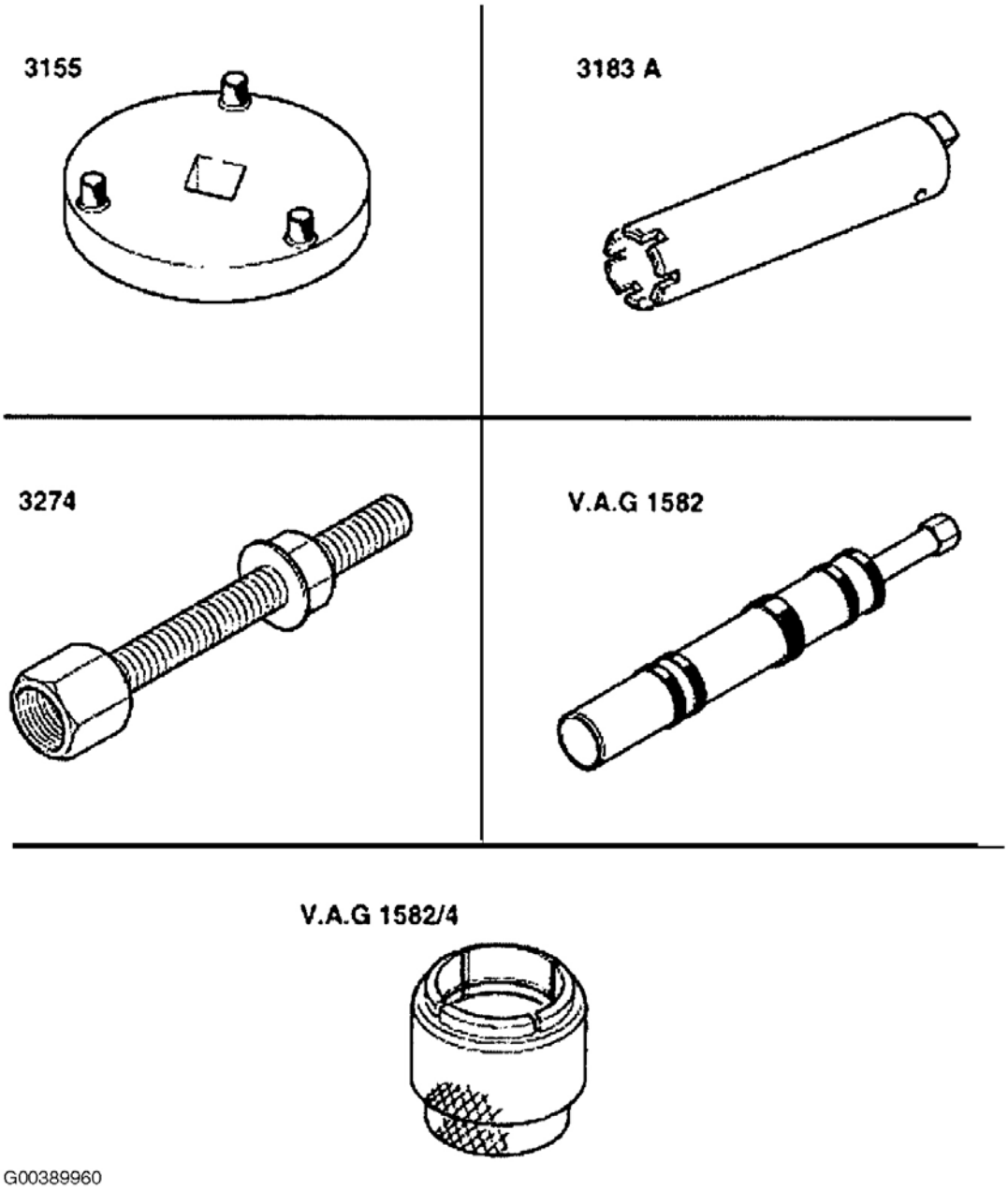
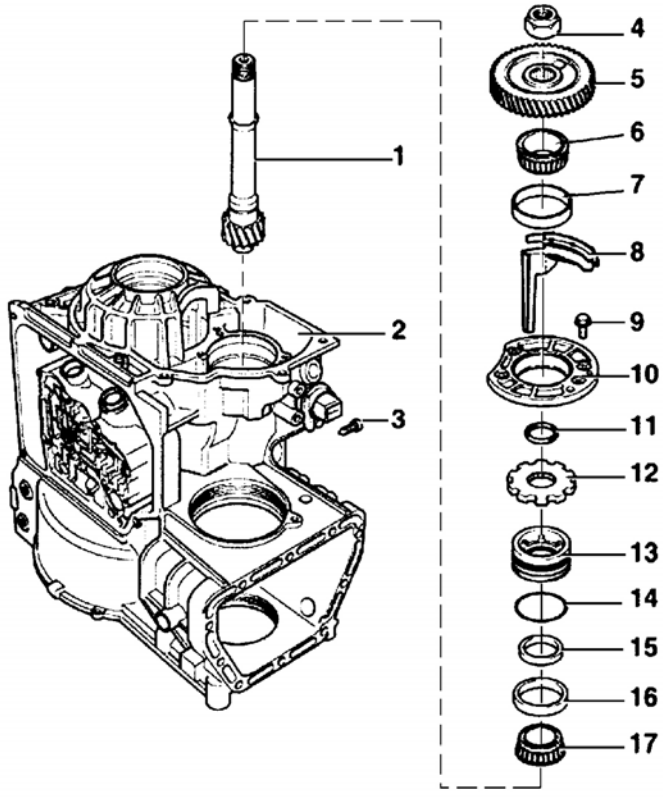


Fig. 168: Pulling Off Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Before installing extractor position press piece 40-105 on differential housing.

NOTE: Both tapered roller bearing inner races are pulled off the differential housing in the same way.

Pressing on tapered roller bearing inner race



Note:
To remove the drive pinion, the selector shaft must be removed after taking out the parking lock.

1. Drive Pinion
2. Transmission Housing
3. Screw, 12 Nm
   Remove screw before removing or installing bearing supporting ring -item 13 -.
   Insert with sealing agent AKD 456 000 01
4. Hex Nut, 250 Nm
   Engage parking lock to remove or install
   Secure with drift
5. Output Gear
   If signs of damage exist, always replace input gear and output gear together
6. Tapered Roller Bearing Inner Race
7. Tapered Roller Bearing Outer Race
   Drive out with drift
8. ATF oil deflector
   Install together with bearing cap -item 10 -
9. Bolt, 25 Nm
10. Bearing Cap
11. Shim
12. Parking Lock Gear
    Rounded side faces teeth of drive pinion
13. Bearing Supporting Ring, 200 Nm
    Remove screw -item 3 - before removing or installing bearing supporting ring.
    Bearing supporting ring cannot be unscrewed until selector shaft has been removed
    Insert bearing supporting ring carefully. Sealing lip and spring must not be damaged.
14. O-Ring
    Always replace
    Place onto bearing supporting ring -item 13 -
15. Oil Seal For Drive Pinion
    Remove with screwdriver
16. Tapered Roller Bearing Outer Race
17. Tapered Roller Bearing Inner Race
    Drive off with drift

G00389961

Fig. 169: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: **The tapered roller bearing inner races for transmission housing and clutch housing are pressed on with the same press tools.**

Pulling tapered roller bearing outer race out of transmission housing

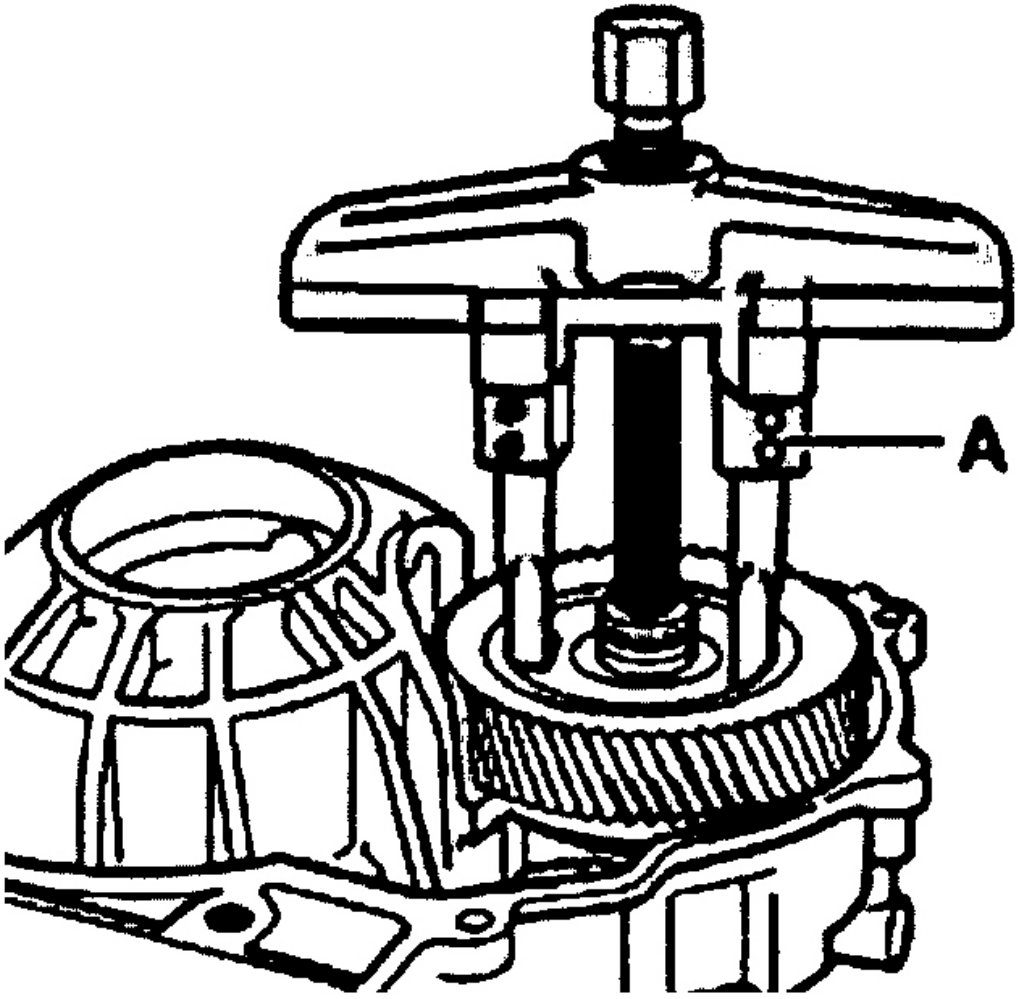


Fig. 170: Pulling Tapered Roller Bearing Outer Race Out Of Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Counter support, e.g. Kukko 22/2
B. Internal puller 46...58 mm, e.g. Kukko 21/7

Pressing tapered roller bearing outer race into transmission housing

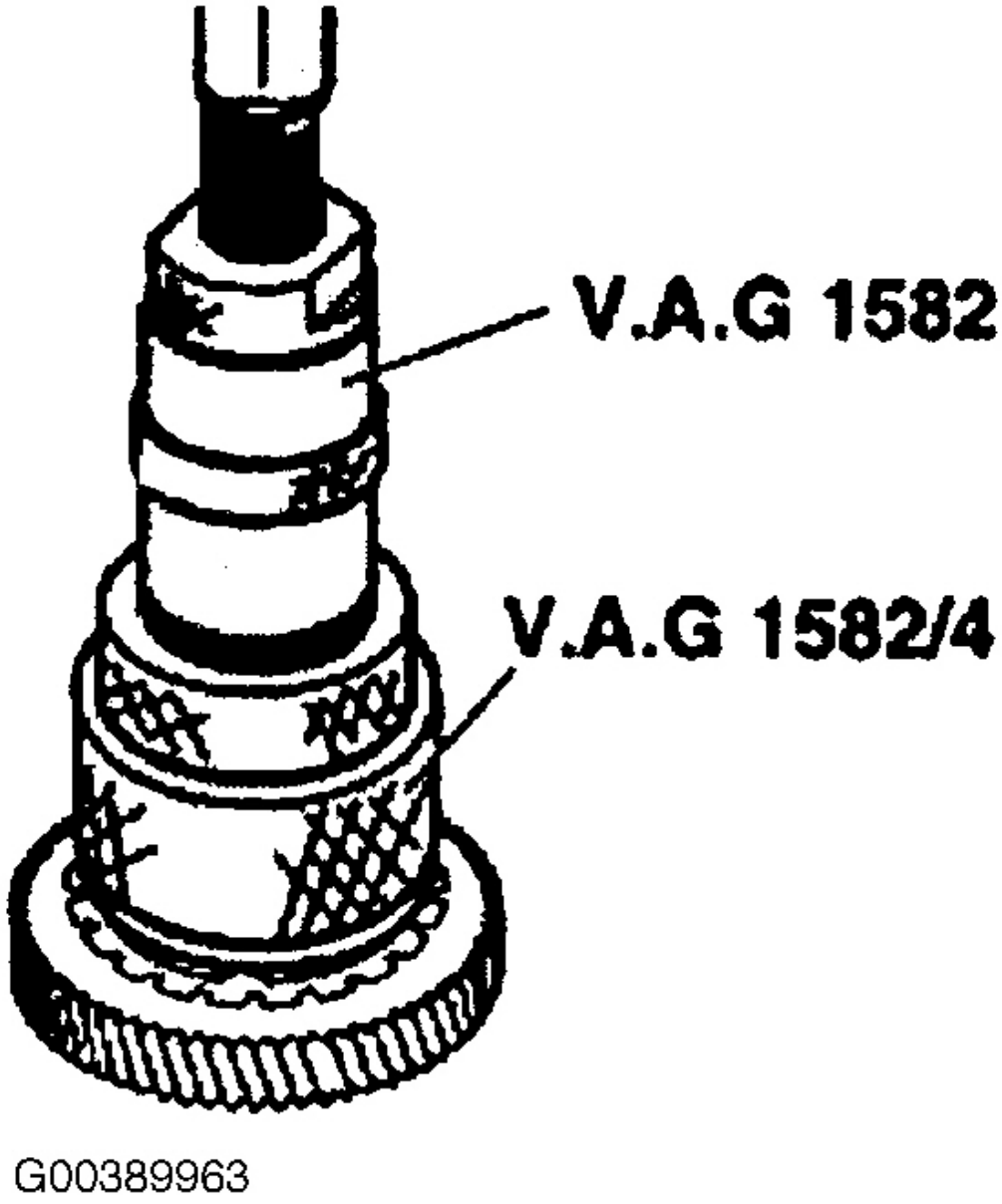


Fig. 171: Pressing Tapered Roller Bearing Outer Race Into Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install shim under outer race.

- Support transmission housing with sleeve 3144 directly below bearing mounting.

Identifying chamfered sides of differential housing

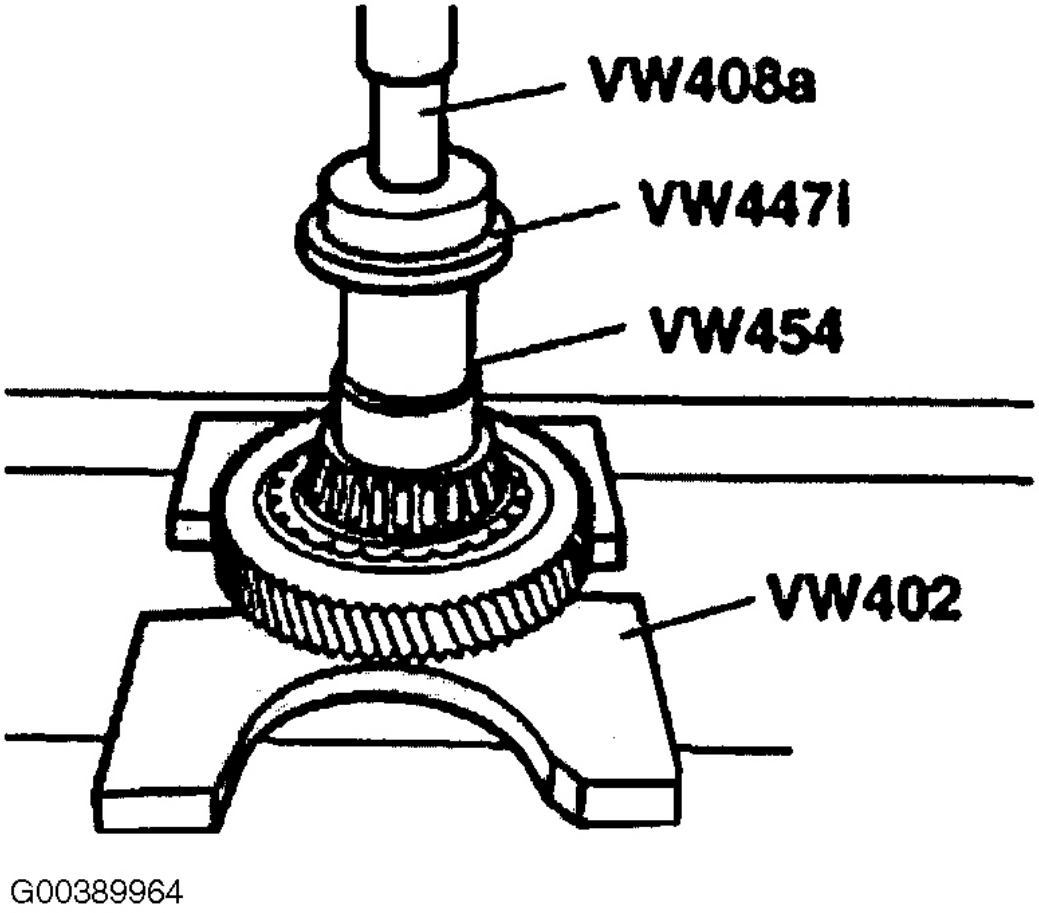


Fig. 172: Identifying Chamfered Sides Of Differential Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Drilling out rivet heads

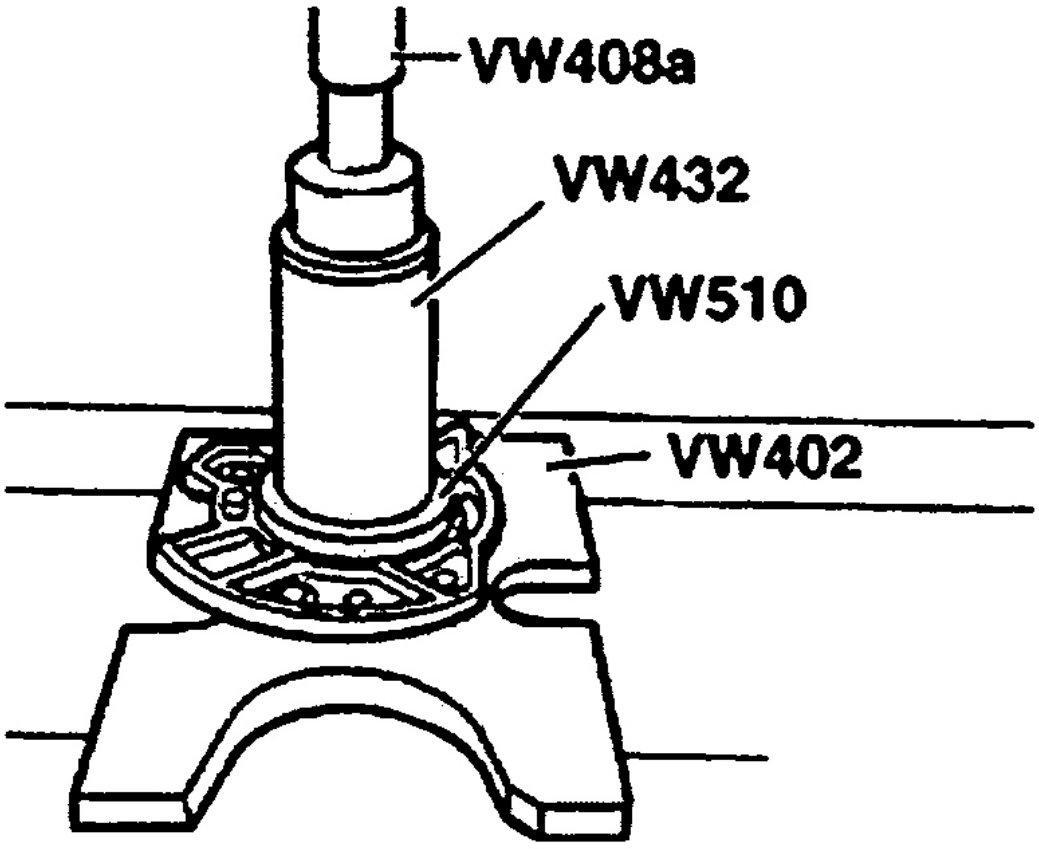


Fig. 173: Drilling Out Rivet Heads
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Drill out rivet heads with 12 mm drill from countersink side and knock-out with drift.

NOTE: Clean differential before and after drilling, protect tapered roller bearing from drilling.

Pressing off final drive gear

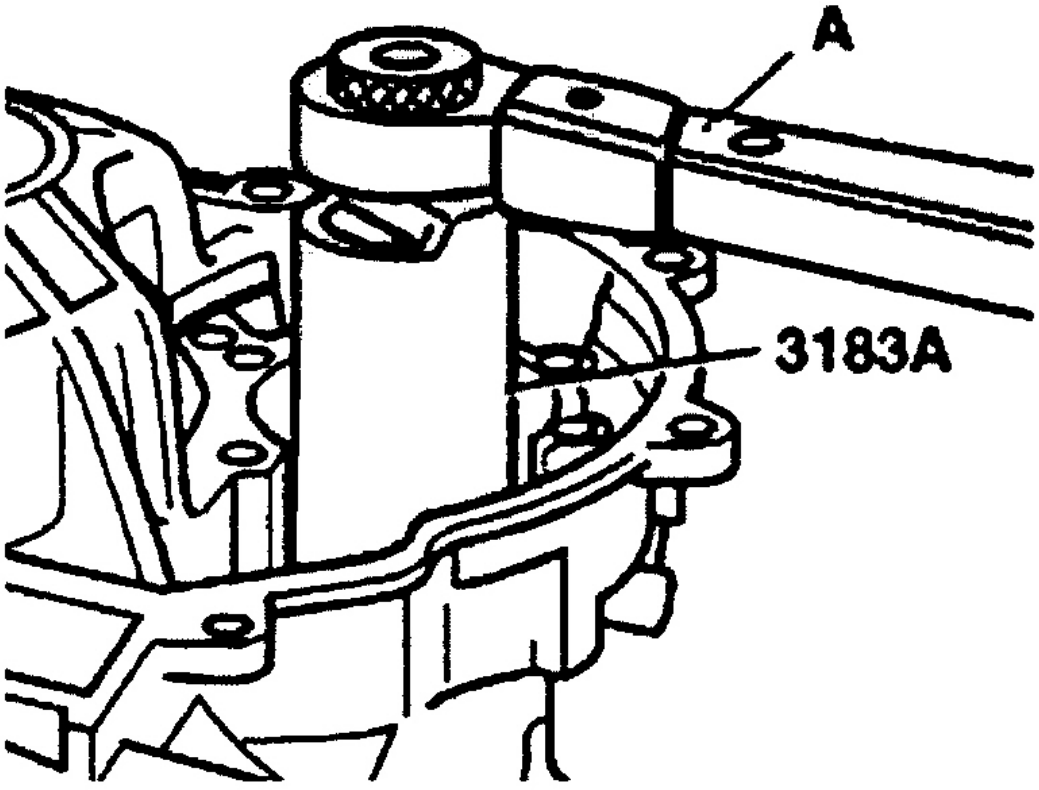


Fig. 174: Pressing Off Final Drive Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Place thrust piece 40-105 on differential housing.

Installation position of final drive gear wheel

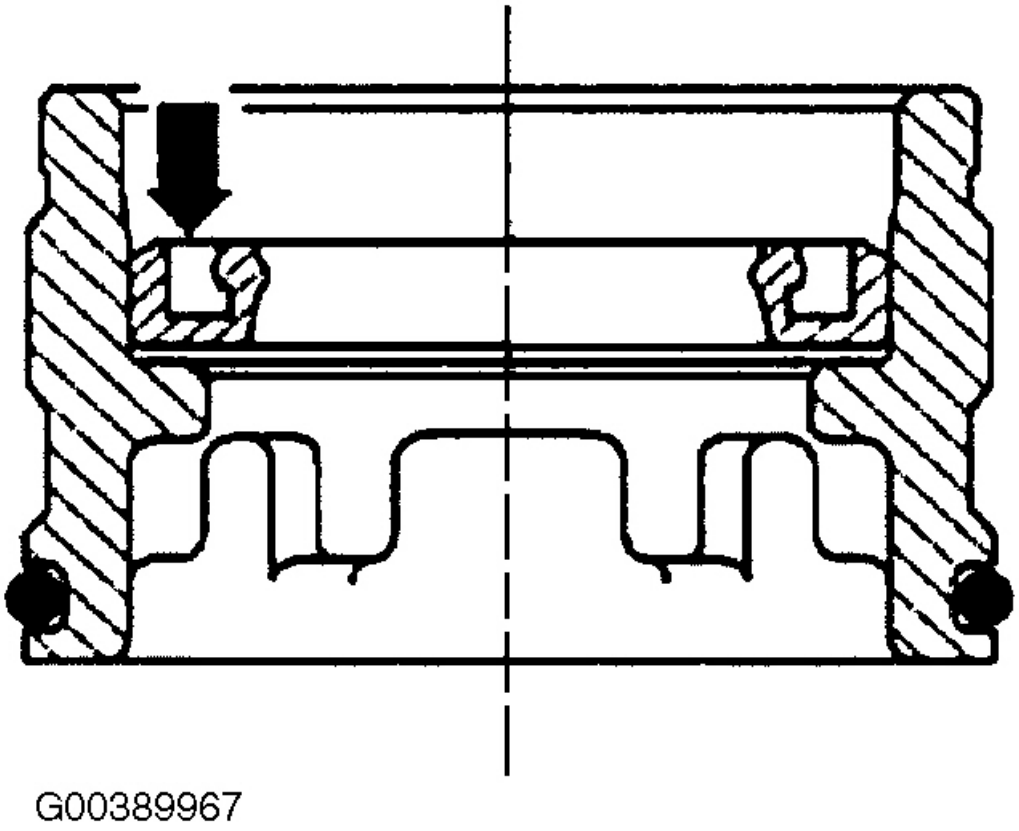


Fig. 175: Identifying Installation Position Of Final Drive Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The circular groove -A- faces toward bolt-on side of differential.

Heating final drive gear wheel to approx. 100° C and installing

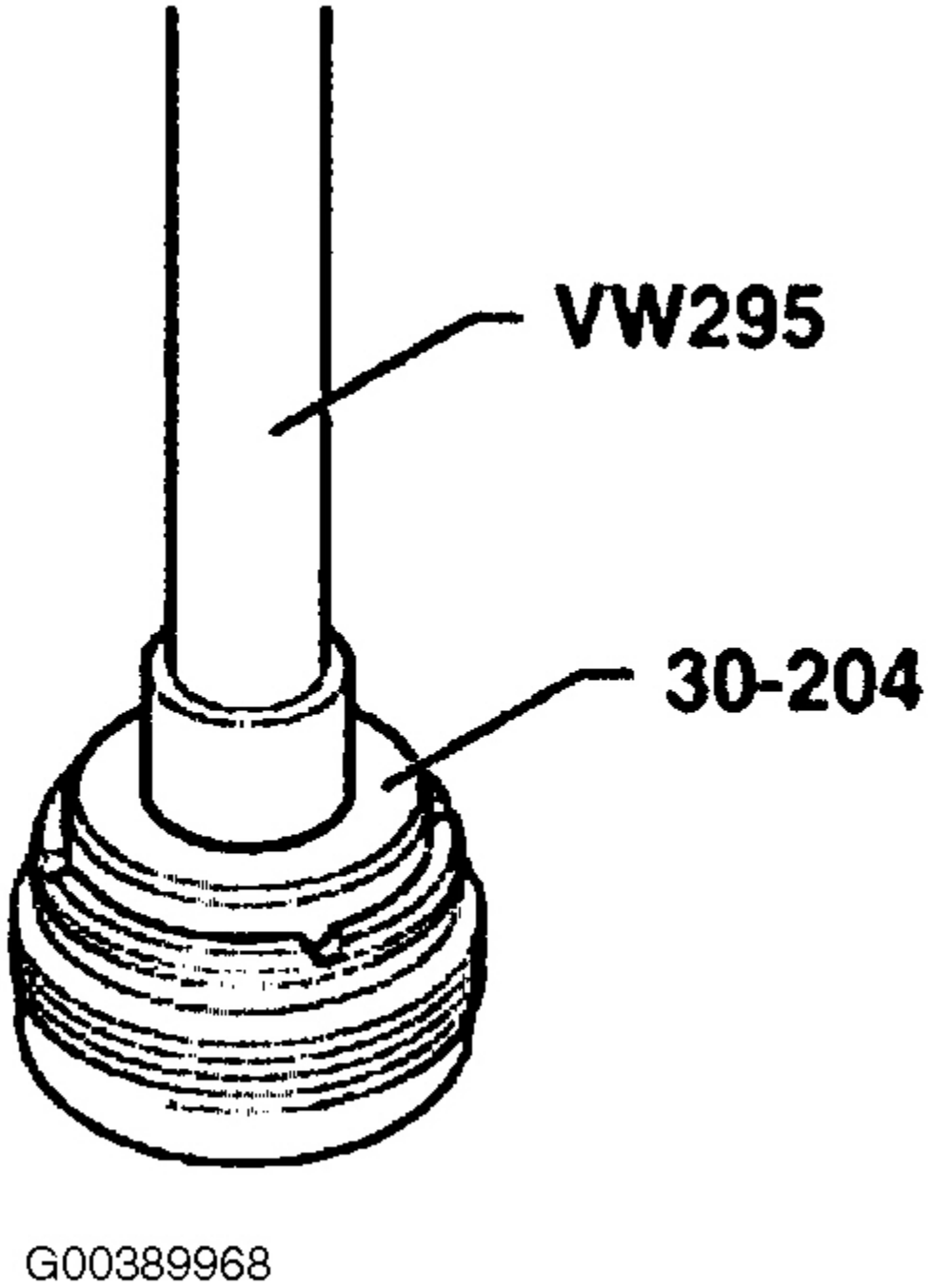


Fig. 176: Heating Final Drive Gear Wheel To Approx. 100° C And Installing

Courtesy of VOLKSWAGEN OF AMERICA, INC.

Use bolts -A- from repair kit to guide final drive gear into position during installation.

Bolting final drive gear and differential housing together

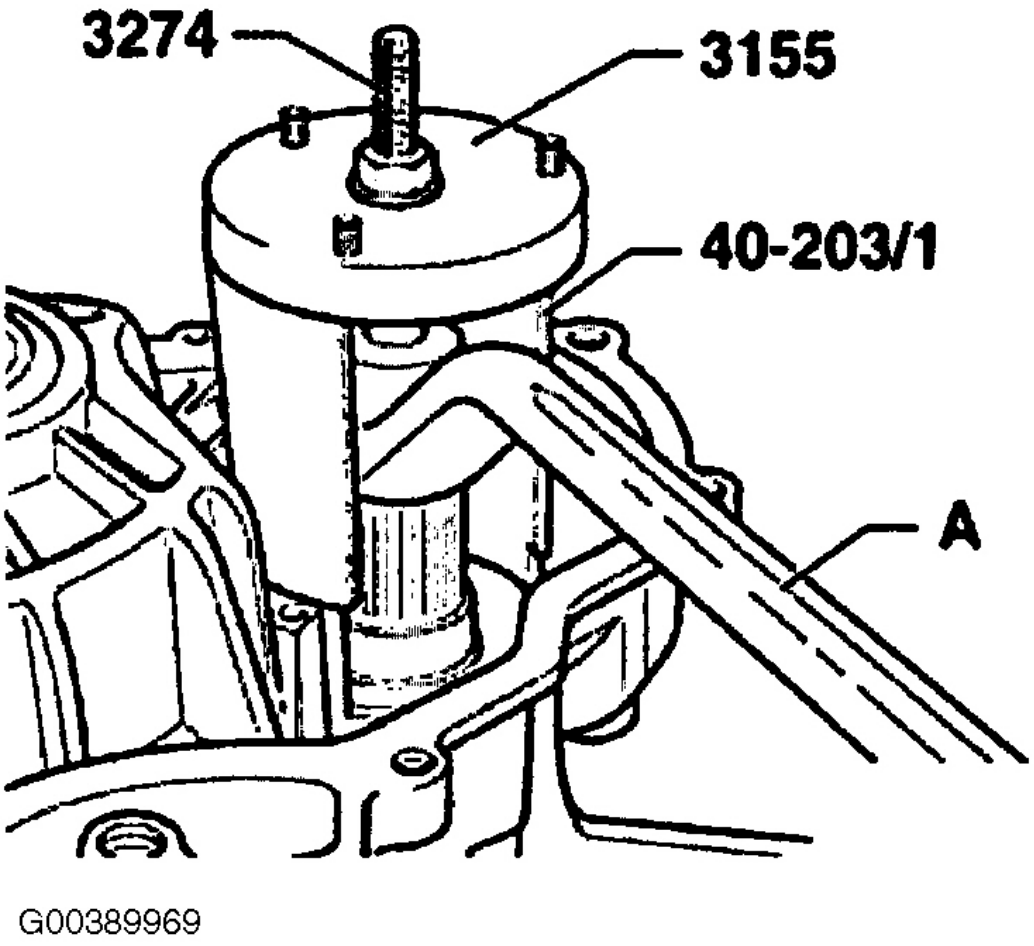


Fig. 177: Bolting Final Drive Gear And Differential Housing Together
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Use special bolts with plates and nuts according to parts catalog.

Removing and installing differential pinion shaft spring pin

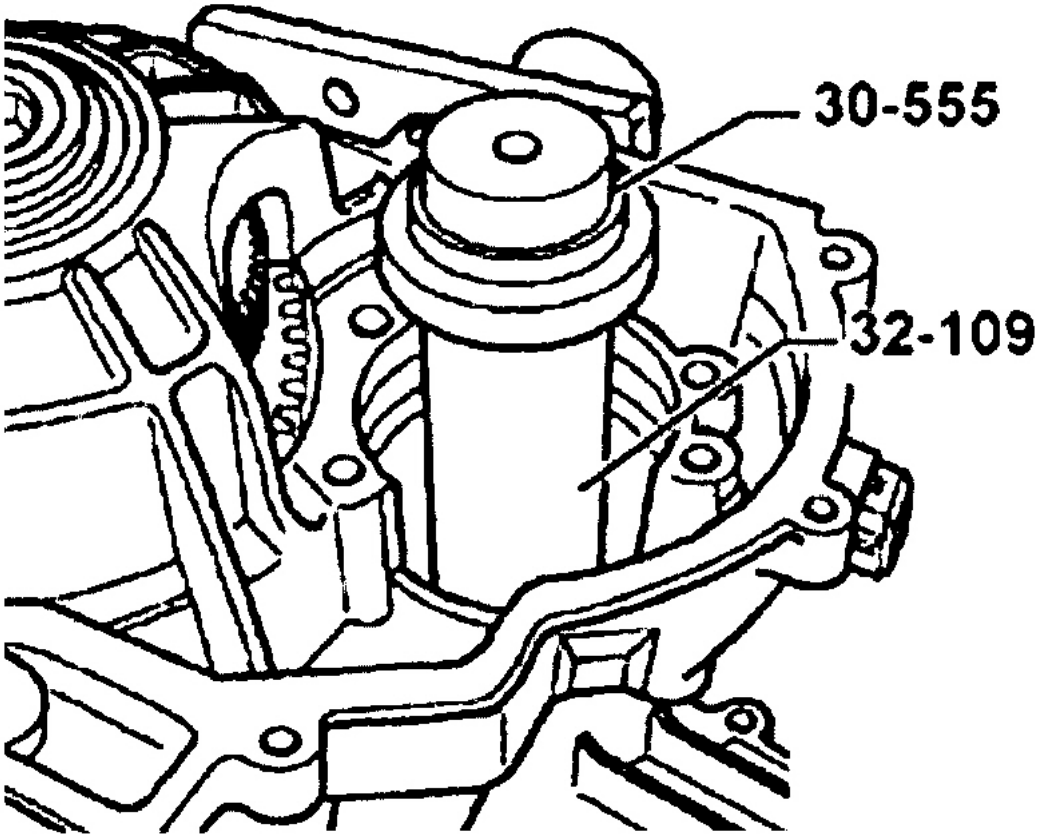


Fig. 178: Removing And Installing Differential Pinion Shaft Spring Pin
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing

- Cover tapered roller bearing inner race and speedometer drive gear to avoid possible damage and ingress of metal particles.
- Knock-out spring pin with chisel, inserting chisel into circumferential groove.

Installing

- Knock fully into differential housing.

Installing differential side gears and pinion gears

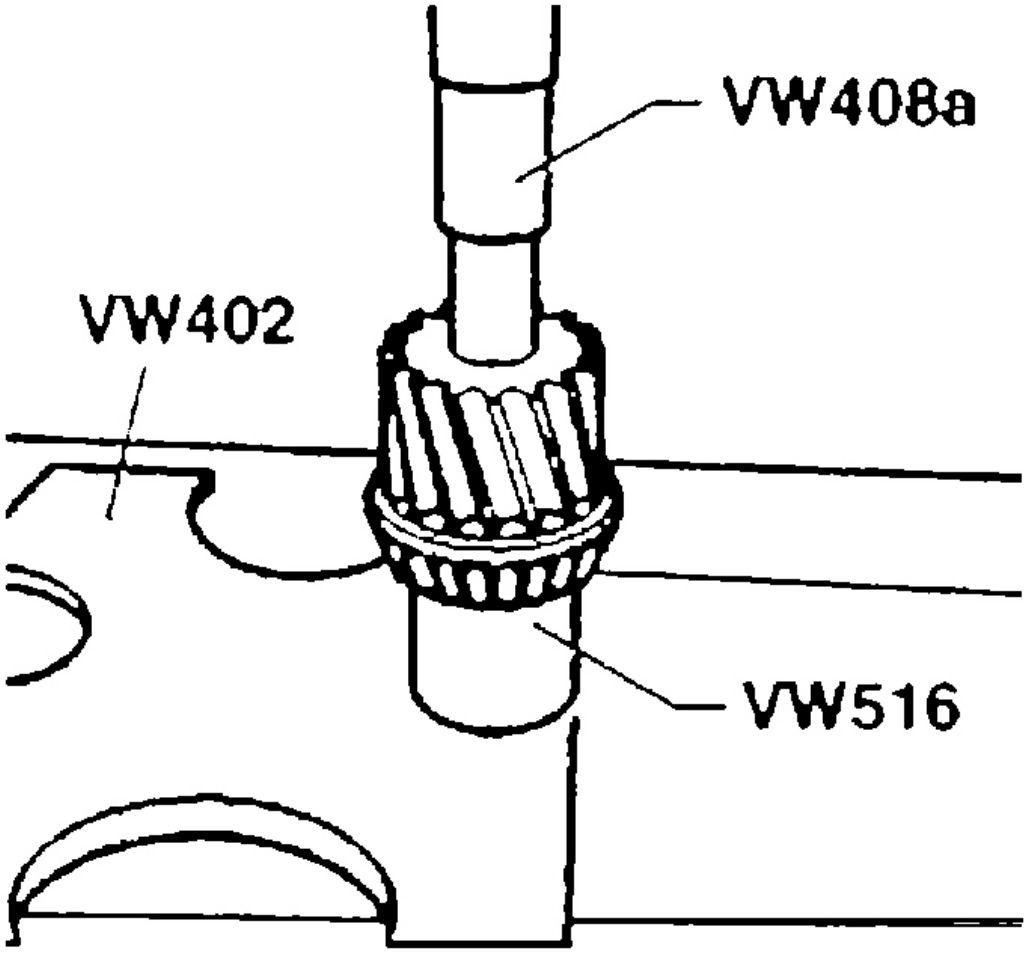


Fig. 179: Installing Differential Side Gears And Pinion Gears
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Lubricate one piece thrust washer with transmission oil and install.
- Install both side gears and secure (e.g. with flange shaft).
- Insert pinion gears (180° apart) and pivot into position.
- Push pinion shaft (arrow -A-) in until first pinion gear.
- Position threaded pieces (arrow -B-) in side gears. Installation position: step faces side gear
- Drive pinion shaft into final position and secure with spring pin.

Changed thrust washer for tapered ring

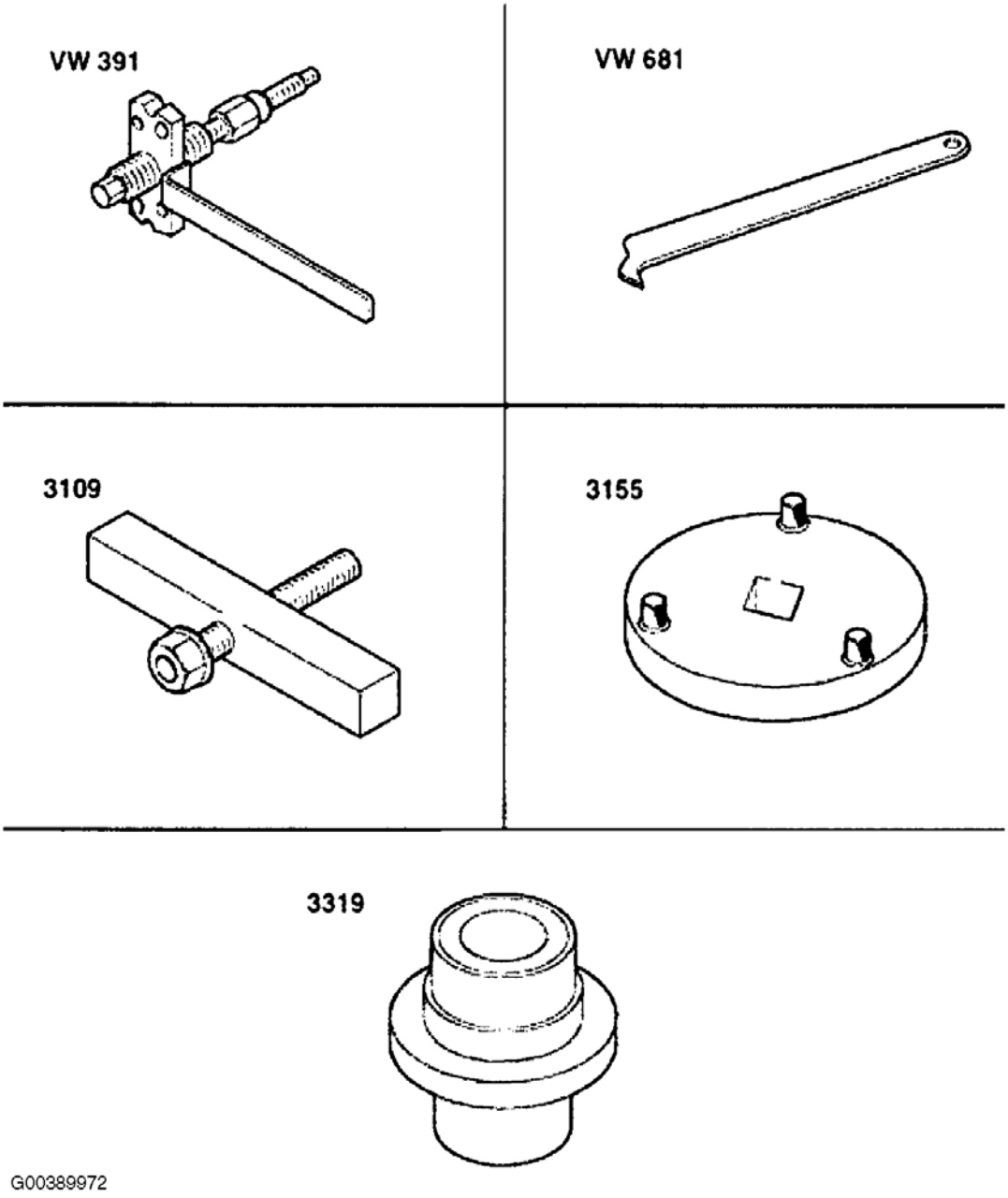


Fig. 180: Identifying Changed Thrust Washer For Tapered Ring
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Installation position:

When the pads -A- are not present, the shoulder (arrow) points to spring -B-.

ADJUSTMENT OVERVIEW

NOTE: **If repairs have been carried out to the transmission it is necessary to adjust the input shaft, output shaft or differential if components have been replaced which have a direct effect on the adjustment of the transmission. Refer to the following table to avoid unnecessary adjustment:**

INPUT SHAFT, OUTPUT SHAFT AND DIFFERENTIAL - ADJUSTMENT OVERVIEW

		Input shaft See INPUT SHAFT, ADJUSTING	Output shaft See OUTPUT SHAFT, ADJUSTING	Differential See DIFFERENTIAL, ADJUSTING
Parts replaced:	Transmission housing	x		x
	Clutch housing	x	x	x
	Input shaft	x		
	Output shaft (final drive)		x	
	Differential housing			x
	Input shaft tapered roller bearing	x		
	Output shaft tapered roller bearing		x	
	Differential tapered roller bearing			x
	4th gear wheel	x		

DIFFERENTIAL, ADJUSTING

Special tools and equipment

- VW 387 Universal dial gauge bracket
- VW 385/17 End measuring plate
- 30-205 Thrust plate
- VW 407 Press tool
- Measuring dial gauge

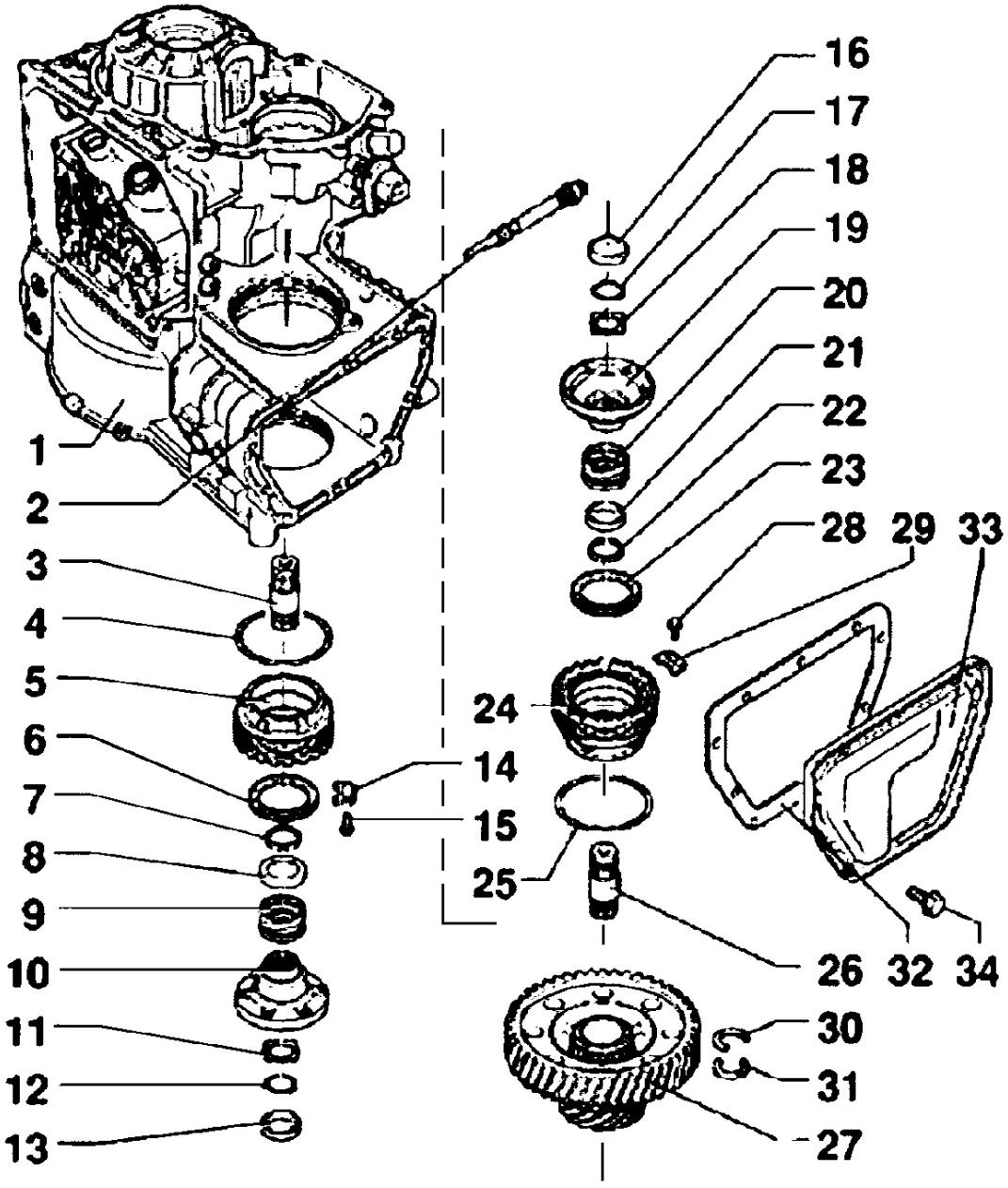


Fig. 181: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The differential must be adjusted, when

- Transmission housing

- Clutch housing
- Differential housing

or the

- Differential tapered roller bearing

have been replaced.

Adjustment overview. See **ADJUSTMENT OVERVIEW** .

- Press tapered roller outer race into clutch housing using press plate 30-205. See **REMOVING** .

NOTE: Tapered roller bearing inner and outer races are paired. Do not interchange!

- Press tapered roller outer race into transmission housing, without adjustment shim, using press plate 30-205. See **REMOVING** .
- Insert differential into clutch housing.
- Install transmission housing and tighten 5 bolts to 25 N.m.
- Mount dial gauge and "0" with 1 mm preload.
- Move differential up and down and recall play indicated on dial gauge (Example: 0.70 mm)

Note: If tapered roller bearings are to be re-used, mark the adjusting ring. The drive pinion does not need to be removed for removing and installing the differential.

1. Transmission Housing
2. Speedometer Drive
3. Output Shaft/Drive Flange
   Install thread facing drive flange
   Remove before taking out differential
   First adjust differential before installing
4. O-Ring (Always replace)
5. Adjusting Ring
   If used bearings are re-installed, mark installation position
   and position on marking again when installing.
   When installing new bearing, pay attention to setting instructions
6. Oil Seal For Drive Flange
   Before installing, pack space between sealing lips with multi-purpose grease
   Can be replaced with transmission installed
   Remove with VW 681
7. Tapered Ring
   Shoulder faces thrust washer
8. Thrust Washer
   Place over compression spring
9. Compression Spring
10. Drive Flange
    Insert with tapered ring, thrust washer and compression spring
    Remove before taking out inner circlip on bevel gear
11. Dished Washer
12. Circlip
13. Cover
14. Locking Element
15. Screw, 12 Nm
16. Cover
17. Circlip
18. Dished Washer
19. Drive Flange
    Insert with tapered ring, thrust washer and compression spring
    Remove before taking out inner circlip on bevel gear
20. Compression Spring
21. Thrust Washer
    Place over compression spring
22. Tapered Ring
    Shoulder faces thrust washer
23. Oil Seal For Drive Flange
    Before installing, pack space between sealing lips with multi-purpose grease
    Can be replaced with transmission installed
    Remove with VW 681
24. Bearing Body, 150 Nm
    When installing new bearing, pay attention to setting instructions.
25. O-ring (Always replace)
26. Output Shaft/Drive Flange
    Install thread facing drive flange
    Before removing, take out differential
    First adjust differential before installing
27. Differential
    Before removing differential, take out bearing body, adjusting ring and output shafts
28. Screw, 12 Nm
29. Locking Element
    After adjusting tapered roller bearings, secure bearing body and adjusting ring.
30. Circlip
    First remove drive flange before removing circlip
31. Circlip
    First remove drive flange before removing circlip
32. Seal (Always replace)
33. Cover (For differential)
34. Screw, 28 Nm
    Insert with locking fluid AMV 185 101 A1

G00389973

Fig. 182: Measuring Differential End Play
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Determining shim thickness

The specified bearing preload is obtained by adding a constant figure (0.40 mm) to the reading obtained.

Example:

DETERMINING SHIM THICKNESS - DIFFERENTIAL BEARING PRELOAD

Reading	0.70 mm

+ Preload (constant figure)	0.40 mm
Thickness of shim =	1.10 mm

- Remove transmission housing and pull tapered roller bearing outer race out from transmission housing. See **REMOVING** .
- Insert shims of correct thickness, thickest shim first.

The following shims are available:

SHIM THICKNESS AVAILABILITY - DIFFERENTIAL BEARING PRELOAD

Size (mm)	Part No.
0.65	02A 409 210
0.70	02A 409 210 A
0.75	02A 409 210 B
0.80	02A 409 210 C
0.85	02A 409 210 D
0.90	02A 409 210 E
0.95	02A 409 210 F
1.00	02A 409 210 G
1.05	02A 409 210 H
1.10	02A 409 210 J
1.15	02A 409 210 K
1.20	02A 409 210 L
1.25	02A 409 210 M

If the size of shim required is larger than those listed in the table, insert two shims totalling the correct figure.

Varying tolerances make it possible by measuring the shims to obtain the exact shim thickness required.

- Press outer race in again and tighten transmission housing securely.